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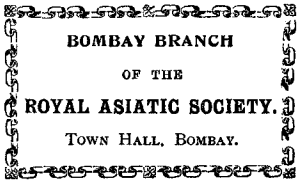

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	PAGE
A.-B. Diesels Motorer (*Sweden*)	xlvii
"All the World's Aircraft"	cii
Anglo-American Oil Co., Ltd.	lxxxvii
Ansaldo, Gio. & Co. (*Italy*)	xxv
Anschutz & Co. (*Germany*)	lxxvi
Armstrong, Sir W. G., Whitworth & Co., Ltd.	xvi
Arrol, Sir William & Co., Ltd.	lxviii
Asiatic Petroleum Co., Ltd.	lxxxvi
Auld, David & Sons, Ltd.	xli
Babcock & Wilcox, Ltd.	liii
Barr & Stroud	xci
Bassett-Lowke, Ltd.	lxxxviii
Beardmore, William & Co., Ltd.	xxiii
Belleville, Delaunay (*France*)	lxxxiv
Bennett Von der Heyde, J.	xc
Bergius Launch & Engine Co.	li
Berliner-Maschinenbau A.-G. (*Germany*)	xlvi
Bethlehem Steel Co. (*U.S.A.*)	xviii
Bofors-Gullspang A.-B. (*Sweden*)	xxxvii
Braintree Castings Co.	xcii
Brazil, Straker & Co., Ltd.	li
Bretagne, Ateliers et Chantiers (*France*)	xli
Brooke, J. W. & Co., Ltd.	li
Brotherhood, Peter, Ltd.	lxxi
Brown Bros. & Co., Ltd.	xiv
Brown, John & Co., Ltd.	xxvi
Bullivant & Co., Ltd.	cx
Burrell & Co., Ltd.	xlv
Cambridge Scientific Instrument Co., Ltd.	xcv
Cammell Laird & Co., Ltd.	xix
Carruthers, J. H. & Co., Ltd.	xlv
Cedervall, F. R. & Söner (*Sweden*)	lvii
Chadburn's (Ship) Telegraph Co., Ltd.	lxxv
Charlton, H. & Co.	xcv
Cockburns, Ltd.	xcvi
Coventry Ordnance Works, Ltd.	xlii
Craig & Donald, Ltd.	lxi
Cribb, Stephen	ciii
Curtis's & Harvey, Ltd.	xli
Darlington Forge Co., Ltd.	xv
Dennystown Forge Co.	xiii
Dermatine Co., Ltd.	xcv
"Dexine" Patent Packing & Rubber Co., Ltd.	xcvi
Diamond Blower Co., Ltd.	ciii
Dick, W. B & Co., Ltd.	lxxxvii
Downie, T. & Co.	lxxiv
Drummond Brothers, Ltd.	lxv
Ebbw Vale Steel, Iron & Coal Co., Ltd.	xcv
Electric Boat Co. (Holland Submarines, *U.S.A.*)	xli
Electromotors, Ltd.	liii
Elliott Brothers	lxxvi
Evershed & Vignoles	*nside front cover*
Fairfield Shipbuilding & Engineering Co., Ltd.	xxxii
Fiat-San Giorgio, Ltd. (*Italy*)	xxxv
Firth, Thos. & Sons, Ltd.	xl
Fore River Shipbuilding Co. (*U.S.A.*)	xviii
Frood, Herbert Co., Ltd.	lxxvii
Geiser, Jean (*Algiers*)	xcix
General Electric Co. (*U.S.A.*)	lxi
General Engine & Boiler Co., Ltd.	lxxxviii
Gibson, Arthur L. & Co.	lxxxii
Glenboig Union Fire Clay Co., Ltd.	xcvii
Graham, A. & Co.	xliii
Greenwood & Batley, Ltd.	lxiv
Hadfield's Steel Foundry Co., Ltd.	cvi
Hall, J. & E., Ltd.	xliii
Hall's Patent Anchor Co., Ltd.	xxxi
Hamble River, Luke & Co., Ltd.	lii
Harlan & Hollingsworth (*U.S.A.*)	xviii
Hastie, John & Co., Ltd.	lxxii
Heath & Co., Ltd.	lxxxix
Hingley, N. & Sons, Ltd.	xxxi
Holland Submarines (Electric Boat Co., *U.S.A.*)	xli
Hoyt Metal Co. of Gt. Britain, Ltd.	ciii
Hulburd Engineering Co., Ltd.	xcvii
Hulse & Co., Ltd.	lxviii
Indestructible Paint Co., Ltd.	cviii
Interlock Metal Hose Co.	xc, xcii, xcvii & xcviii
Isherwood System of Ship Construction	xxvii
Jeffery's Patent Marine Glue	lxxxii
Kawasaki Dockyard Co., Ltd. (*Japan*)	xxix
Kaye, Joseph & Sons, Ltd.	xcjii
Keith, James, & Blackman Co., Ltd.	lvii
Kelvin, Bottomley & Baird, Ltd.	lxxviii
Kermode's Liquid Fuel System	lxxxvi
Krupp, Fried. (*Germany*)	xvii
Langford, G. & Son	xciv
Lidgerwood Mfg. Co. (*U.S.A.*)	lvii
Luke & Spencer, Ltd.	lxviii
Marine & d'Homecourt, Forges des (*France*)	xxxvi
McGeoch, William & Co., Ltd.	xcix
Matthews & Yates, Ltd.	xcvii
Merryweather & Sons, Ltd.	xlviii
Metallic Valve Co.	lii
Midvale Steel Co., The (*U.S.A.*)	xxxviii & xxxix
Mirrlees, Bickerton & Day, Ltd.	xxxiii
Mirrlees, Watson & Co., Ltd.	xxxiii
Molinari, Pietro (*Italy*)	lxxvii
Muir, Wm. & Co., Ltd.	lxxvii
"Naval & Military Record"	ci
Naval War Game	xcviii
Newall, R. S. & Son, Ltd.	xlviii
Newalls Insulation Co., Ltd.	lxxxv
Niclausse, Jo. & A. (*France*)	lxxxiv
Niles-Bement-Pond Co. (*U.S.A.*)	lxiii
Normand, Augustin, Ltd. (*France*)	xxxi
North British Rubber Co., Ltd.	lxvi
Officine Meccaniche, Sta. Ana (*Italy*)	lx
Orlando, Fratelli & C. (*Italy*)	xxx
Park Gate Iron & Steel Co., Ltd.	l
Parsons, W. H. (*Fighting Ships* Advts.)	iv
Parsons Marine Steam Turbine Co., Ltd.	xii
Pattison, C. & T. T. (*Italy*)	xxviii
Power Plant Co., Ltd.	xcii
Pratt & Whitney (*U.S.A.*)	lxiii
Pratt's Motor Spirit	lxxxvii
Reavell, W. & Co., Ltd.	lxx
Reddaway, F. & Co., Ltd.	lxxxviii
Renold, Hans, Ltd.	lii
Robertson, David & Co., Ltd.	xc
Ross, Ltd.	lxxxiii
Robinson, H. E. C. & Co., Ltd.	civ
Rotherham Forge & Rolling Mills Co., Ltd.	xcvi
St. Nazaire, Chantier et Ateliers (*France*)	xxii
Sampson Low, Marston & Co., Ltd.	c
Schichau, F. (*Germany*)	cxi
Schiess, Ernst. (*Germany*)	lxii
Schneider & Co. (*France*)	xxiv
Schuette Recording Compass Co. (*U.S.A.*)	xciv
Seagers, Ltd	xcvi
Seamless Steel Boat Co., Ltd.	li
Seattle Construction & Dry Dock Co. (*U.S.A.*)	xxxi
Siebe, Gorman & Co., Ltd.	xx
Simplex Conduits, Ltd.	ci
Smith, Thos. & Wm., Ltd.	lxvii
Smith & Wellstood, Ltd.	xciv
Smulders, A. F. & Co. (Werf Gusto) (*Holland*)	lxix
Somers, Walter & Co., Ltd.	lxxxi
Sperry Gyroscope Co. (*U.S.A.*)	lxxix
Sprengstoff A.-G. Carbonit (*Germany*)	xlvi
Stabilimento Tecnico Trestino (*Austria*)	xxxiii
Stone, J. & Co., Ltd.	lxxiii
Symonds & Co.	xcvi
Tandem Smelting Co., Ltd.	xciii
Thornycroft, John I. & Co., Ltd.	cv
Thorn & Hoddle Acetylene Co., Ltd.	xciv
Tosi, Franco (*Italy*)	lvi
Trist, Ronald & Co., Ltd.	xciii
Union Iron Works (*U.S.A.*)	xviii
United Flexible Metallic Tubing Co., Ltd.	cix
Vacuum Oil Co., Ltd.	ii
Venesta, Ltd.	xcix
Vickers, Ltd.	xxi
Walker, Thomas & Son, Ltd.	lv
Wallsend Slipway & Engineering Co., Ltd.	xxxiv
Wallwork, Henry & Co., Ltd.	lxxvii
Ward, Thos. W., Ltd.	*inside back cover*
Warner, Robt. & Co. (Engineers), Ltd.	xxxv
Webley & Scott, Ltd.	xliv
Werf. Gusto (A. F. Smulders & Co.) (*Holland*)	lxix
Westinghouse Brake Co., Ltd.	lix
Westinghouse Machine Co. (*U.S.A.*)	lviii
White, J. Samuel & Co., Ltd.	liv
Widdowson, John H.	xc
Wilcox, W. H. & Co., Ltd.	xliii
Wolseley Tool & Motor Car Co, Ltd.	xlix
Wyss, Escher & Co. (*Switzerland*)	lx
Yarrow & Co., Ltd.	lxxxv
Yorkshire Copper Works, Ltd.	xiii
Zeiss, Carl (London) Ltd.	lxxx

CLASSIFIED LIST OF ADVERTISERS.

PAGE

Advertisements.
Parsons, W. H. ("Fighting Ships," 1915 Edition) iv

Aeroplanes and Airships.
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Coventry Ordnance Works, Ltd. xlii
Hamble River, Luke & Co., Ltd. .. lii
Vickers, Ltd. xxi
White, J. Samuel & Co., Ltd. .. liv

Air Compressors.
Berliner Maschinenbau A. G. (Germany) xlvi
Brazil, Straker & Co., Ltd. .. li
Brotherhood, Peter, Ltd. lxxi
General Engine & Boiler Co., Ltd. lxxxviii
Niclausse, Jo. & A. (France) .. lxxxiv
Reavell, W. & Co., Ltd. lxx
Siebe, Gorman & Co., Ltd. .. xx
Westinghouse Brake Co., Ltd. .. lix

Ammunition (War).
Ansaldo, Gio & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Bethlehem Steel Corporation (*U.S.A.*) xviii
Bofors-Gullspang (*Sweden*) .. xxxvii
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Coventry Ordnance Works, Ltd. xlii
Firth, Thos. & Sons, Ltd. .. xl
Hadfield's Steel Foundry Co., Ltd. evi
Marine & d'Homecourt, Forges des (*France*) xxxvi
Midvale Steel Co. (*U.S.A.*) xxxviii & xxxix
Schneider & Co. (*France*) xxiv
Sprengstoff A-G Carbonit (*Germany*) xlvi
Vickers, Ltd. xxi

Ammunition (Sporting).
Curtis's & Harvey, Ltd. xli

Anchors.
Borfors-Gullspang (*Sweden*) .. xxxvii
Charlton, H. & Co. xcv
Hall's Patent Anchor Co., Ltd. .. xxxi

PAGE

Anti-Fouling & Anti-Corrosive Compositions.
Burrell & Co., Ltd. xlv
Indestructible Paint Co., Ltd. .. cviii

Anti-Friction Metals.
Hoyt Metal Co. of Gt. Britain, Ltd. ciii
Tandem Smelting Co., Ltd. .. xciii

Armour Plates.
Ansaldo, Gio & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Beardmore, William & Co., Ltd. .. xxiii
Bethlehem Steel Corporation (*U.S.A.*) xviii
Bofors-Gullspang (*Sweden*) .. xxxvii
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Hadfield's Steel Foundry Co., Ltd. evi
Krupp, Fried (*Germany*) xvii
Marine & d'Homecourt, Forges des (*France*) xxxvi
Midvale Steel Co. (*U.S.A.*) xxxviii & xxxix
Orlando, Fratelli & Co. (*Italy*) .. xxx
Schneider & Co. (*France*) xxiv
Vickers, Ltd. xxi

Ash Expellers.
Stone, J. & Co., Ltd. lxxiii

Axles, Tyres, Springs.
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Ebbw Vale Steel, Iron & Coal Co., Ltd. xcv
Marine & d'Homecourt, Forges des (*France*) xxxvi
Vickers, Ltd. xxi

Belting.
Dermatine Co., Ltd. xcv
Reddaway, F. & Co., Ltd. lxxxviii

Boat-Releasing Gear.
Robinson, H. E. C., & Co., Ltd. .. civ

PAGE

Boilers.
Ansaldo, Gio & Co. (*Italy*) .. xxv
Babcock & Wilcox, Ltd. liii
Beardmore, William & Co., Ltd xxiii
Belleville, Delaunay (*France*) .. lxxxiv
Bretagne, Ateliers et Chantiers (*France*) xli
Cammell Laird & Co., Ltd. .. xix
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Niclausse, Jo. & A. (*France*) .. lxxxiv
Normand, Augustin, Ltd. (*France*) xxxi
Officine Meccaniche (*Italy*) .. lx
Orlando, Fratelli & Co. (*Italy*) .. xxx
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Schneider & Co. (*France*) xxiv
Seattle Construction & Dry Dock Co. (*U.S.A.*) xxxi
Stabilimento Tecnico Triestino (*Austria*) xxxiii
Thornycroft, John I. & Co., Ltd. cv
Tosi, Franco (*Italy*) lvi
Wallsend Slipway & Engineering Co., Ltd. xxxiv
White, J. Samuel & Co., Ltd. .. liv
Yarrow & Co., Ltd. lxxxv

Boiler Coverings.
Newalls Insulation Co., Ltd. .. lxxxv

Boiler Fittings, &c.
Brown, John & Co., Ltd. xxvi
Cockburns, Ltd. xcvi
Evershed & Vignoles, Ltd. *inside front cover*
Metallic Valve Co. lii
Niclausse, Jo. & A. (*France*) .. lxxxiv
Normand, Augustin, Ltd. (*France*) xxxi
Trist, Ronald & Co., Ltd. .. xciii

Brake & Clutch Linings.
Frood Herbert Co., Ltd. lxxvii

Bridges.
Arrol, Sir William & Co., Ltd. .. lxvii
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix

PAGE

Cables (Electric).
General Electric Co. (*U.S.A.*) .. lxi

Capstans.
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
General Engine & Boiler Co., Ltd. lxxxviii

Castings & Forgings.
Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Beardmore, William & Co., Ltd. xxiii
Bethlehem Steel Corporation (*U.S.A.*) xviii
Bofors-Gullspang (*Sweden*) .. xxxvii
Braintree Castings Co. xcii
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Darlington Forge Co., Ltd. (Gun and Turbine) xv
Dennystown Forge Co. xiii
Ebbw Vale Steel, Iron & Coal Co., Ltd. xcv
Firth, Thos. & Sons, Ltd. .. xl
Hadfield's Steel Foundry Co., Ltd. evi
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Krupp, Fried. (*Germany*) xvii
Marine & d'Homecourt, Forges des (*France*) xxxvi
Midvale Steel Co. (*U.S.A.*) xxxviii & xxxix
Rotherham Forge & Rolling Mills Co., Ltd. xcvi
Schichau, F. (*Germany*) cxi
Somers, Walter & Co., Ltd. .. lxxxi

Chain Drives.
Renold, Hans, Ltd. lii
Westinghouse Brake Co., Ltd. .. lix

Coaling Apparatus.
Lidgerwood Mfg. Co. (*U.S.A.*) .. lvii

CLASSIFIED LIST OF ADVERTISERS.—*Continued.*

PAGE

Compasses.

Anschutz & Co. (*Germany*) .. lxxvi
Elliott Brothers lxxvi
Kelvin, Bottomley & Baird, Ltd. lxxviii
Schuette Recording Compass Co. (*U.S.A.*) xciv
Sperry Gyroscope Co. (*U.S.A.*) .. lxxix

Condensing & Distilling Plants.

Bretagne, Ateliers et Chantiers (*France*) xlii
Mirrlees Watson Co., Ltd. .. xxxiii
Normand, Augustin, Ltd. (*France*) xxxi
Westinghouse Machine Co. (*U.S.A.*) lviii

Conduits (Steel).

Simplex Conduits, Ltd. ci

Copper & Alloys.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Hoyt Metal Co. of Gt. Britain, Ltd. ciii
Tandem Smelting Co., Ltd. .. xciii
Vickers, Ltd. xxi
Yorkshire Copper Works, Ltd. .. xiii

Cranes.

Armstrong, Sir. W. G., Whitworth & Co., Ltd xvi
Arrol, Sir William & Co., Ltd .. lxviii
Werf Gusto (A F Smulders & Co.) (*Holland*) lxix

Cranes (Floating).

Vickers, Ltd xxi
Werf Gusto (A F Smulders & Co.) (*Holland*) lxix

Diving Apparatus.

Siebe, Gorman & Co., Ltd .. xx

Docks (Floating).

Armstrong, Sir. W. G., Whitworth & Co , Ltd xvi
Cammell Laird & Co., Ltd .. xix
Vickers, Ltd xxi

PAGE

Drawing Office Supplies

Robertson, David & Co., Ltd. .. xc

Dredgers.

Bretagne, Ateliers et Chantiers (*France*) xli
Schichau, F. (*Germany*) cxi
Vickers, Ltd. xxi
Werf Gusto (A. F. Smulders & Co.) (*Holland*) lxix

Dynamos.

Electromotors, Ltd. liii
Greenwood & Batley, Ltd. .. lxiv

Electrical Distribution Boxes.

General Electric Co. (*U.S.A.*) .. lxi

Electrical Plant.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
General Electric Co. (*U.S.A.*) .. lxi
Vickers, Ltd. xxi
Westinghouse Brake Co., Ltd. .. lix
Westinghouse Machine Co. (*U.S.A.*) lviii

Engines (Aerial).

Armstrong, Sir. W. G., Whitworth & Co., Ltd. xvi
Hamble River, Luke & Co., Ltd. .. lii
Vickers, Ltd. xxi
Wolseley Tool & Motor Car Co., Ltd. xlix

Engines (Fire).

Merryweather & Sons, Ltd. .. xlviii

Engines (Gas).

Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Beardmore, William & Co., Ltd. xxiii
Bethlehem Steel Corporation (*U.S.A.*) xviii
Fairfield Shipbuilding & Engineering Co., Ltd. xxxii
Tosi, Franco (*Italy*) lvi
Vickers, Ltd. xxi

PAGE

Engines (Marine).

A. B. Diesels Motorer (*Sweden*) .. xlvii
Ansaldo, Gio. & Co., (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Bethlehem Steel Corporation (*U.S.A.*) xviii
Brazil Straker & Co., Ltd. .. li
Bretagne, Ateliers et Chantiers (*France*) xli
Brown Bros. & Co., Ltd. xiv
Cammell Laird & Co., Ltd. .. xix
Fairfield Shipbuilding & Engineering Co., Ltd. xxxii
Fiat-San Giorgio, Ltd. (*Italy*) .. xxxv
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Midvale Steel Co. (*U.S.A.*) xxxviii & xxxix
Officine Meccaniche (*Italy*) .. lx
Orlando Fratelli & Co. (*Italy*) .. xxx
Pattison, C. & T. T. (*Italy*). .. xxviii
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Schichau, F. (*Germany*) cxi
Schneider & Co. (*France*) xxiv
Seattle Construction & Dry Dock Co. (*U.S.A.*) xxxi
Stabilimento Tecnico Triestino (*Austria*) xxxiii
Thornycroft, John I. & Co., Ltd. cv
Tosi, Franco (*Italy*) lvi
Vickers, Ltd. xxi
Wallsend Slipway & Engineering Co., Ltd. xxxiv
Wolseley Tool & Motor Car Co., Ltd. xlix

Engines (Motor).

A. B. Diesels Motorer (*Sweden*) .. xlviii
Ansaldo, Gio. & Co. (*Italy*) .. xxv
Bergius Launch & Engine Co. .. li
Brazil, Straker & Co., Ltd. .. li
Brooke, J, W. & Co., Ltd. .. li
Hamble River, Luke & Co., Ltd. .. lii
Krupp, Fried. (*Germany*) xvii
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Thornycroft, John I. & Co., Ltd. cv
Wolseley Tool & Motor Car Co., Ltd. xlix

PAGE

Engines (Oil).

A. B. Diesels Motorer (*Sweden*) .. xlvii
Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Beardmore, William & Co., Ltd. .. xxiii
Bethlehem Steel Corporation (*U.S.A.*) xviii
Brazil, Straker & Co., Ltd. .. li
Cammell Laird & Co., Ltd. .. xix
Fairfield Shipbuilding & Engineering Co., Ltd. xxxii
Krupp, Fried. (*Germany*) xvii
Mirrlees, Bickerton & Day, Ltd. .. xxxiii
Normand, Augustin, Ltd. (*France*) xxxi
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Schneider & Co. (*France*) xxiv
Stabilimento Tecnico Triestino (*Austria*) xxxiii
Thornycroft, John I. & Co., Ltd. cv
Tosi, Franco (*Italy*) lvi
Vickers, Ltd. xxi
Wallsend Slipway & Engineering Co., Ltd. xxxiv
Westinghouse Brake Co., Ltd. .. lix

Engines (Pumping).

Brown Bros. & Co., Ltd. xiv
Carruthers, J. H. & Co., Ltd. .. xlv
Greenwood & Batley, Ltd. .. lxiv

Engines (Railway).

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Merryweather & Sons, Ltd. .. xlviii
Officine Meccaniche (*Italy*) .. lx
Schichau, F. (*Germany*) cxi

Explosives.

Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Bofors-Gullspang (*Sweden*) .. xxxvii
Coventry Ordnance Works, Ltd. .. xlii
Curtis's & Harvey, Ltd. xli
Greenwood & Batley, Ltd. .. lxiv
Schneider & Co. (*France*) xxiv
Sprengstoff, A-G. Carbonit (*Germany*) xlvi
Vickers, Ltd. xxi

CLASSIFIED LIST OF ADVERTISERS.—*Continued.*

PAGE

Fans & Blowers.

Brotherhood, Peter Ltd. lxxi
Greenwood & Batley, Ltd. .. lxiv
Keith, James, & Blackman Co., Ltd. lvii
Matthews & Yates, Ltd. xcvii
Westinghouse Machine Co. (*U.S.A.*) lviii

Fire Clay.

Glenboig Union Fire Clay Co., Ltd. xcvii

Fire Control & Gunnery Fittings.

Barr & Stroud xci
Evershed & Vignoles, Ltd. .. *inside front cover*
Ross, Ltd. lxxxiii
Sperry Gyroscope Co. (*U.S.A.*) .. lxxix
Vickers, Ltd. xxi
Ziess, Carl (London) Ltd. lxxx

Fire & Salvage Boats.

Merryweather & Sons, Ltd. .. xlviii

Flue Blowers.

Diamond Blower Co., Ltd. .. ciii

Furnace Fittings.

Downie, T. & Co. lxxiv

Gears.

Power Plant Co., Ltd. xcii
Renold, Hans, Ltd. lii
Wallwork, Henry & Co., Ltd. .. lxxvii
Westinghouse Brake Co., Ltd .. lix

Generators (Electric).

Brotherhood, Peter, Ltd. lxxi
General Electric Co. (*U.S.A.*) .. lxi
Vickers, Ltd. xxi
Westinghouse Brake Co., Ltd. .. lix
Westinghouse Machine Co. (*U.S.A.*) lviii

Glues (Marine).

Jeffery's Patent Marine Glue .. lxxxii
Langford, G. & Son xciv

Grinding Machinery.

Luke & Spencer, Ltd. lxviii
Simplex Conduits, Ltd. ci

PAGE

Guns and Mountings.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xv
Beardmore, William & Co., Ltd. xxiii
Bethlehem Steel Corporation (*U.S.A.*) xviii
Bofors-Gullspang (*Sweden*) .. xxxvii
Brown, John & Co., Ltd. xxvi
Coventry Ordnance Works, Ltd. xlii
Darlington Forge Co., Ltd. .. xv
Krupp, Fried. (*Germany*) xvii
Marine & d'Homecourt, Forges des (*France*) xxxvi
Midvale Steel Co (*U.S.A.*) xxxviii & xxxix
Orlando, Fratelli & Co. (*Italy*) .. xxx
Schneider & Co. (*France*) xxiv
Vickers, Ltd. xxi

Guns (Sporting).

Webley & Scott, Ltd. xliv

Heating & Ventilating.

General Electric Co. (*U.S.A.*) .. lxi
Greenwood & Batley, Ltd. .. xliv
Keith, James & Blackman Co., Ltd. lvii
Matthews & Yates, Ltd. xcvii
Niclausse, Go. & A. (*France*) .. lxxxiv
Simplex Conduits, Ltd. ci
Smith & Wellstood, Ltd. xciv
Westinghouse Brake Co., Ltd. .. lix

Hoisting Machinery.

Brazil, Straker & Co., Ltd. .. li
Lidgerwood Mfg. Co. (*U.S.A.*) .. lvii

Hose Outfits.

Dermatine Co., Ltd. xcv
Interlock Metal Hose Co. .. .. xc, xcii, xcvii & xcviii
Merryweather & Sons, Ltd. .. xlviii
North British Rubber Co., Ltd. .. lxvi
Reddaway, F. & Co., Ltd. lxxxviii
United Flexible Metallic Tubing Co., Ltd. cix
Willcox, W. H. & Co., Ltd. .. xliii

PAGE

Hydraulic Plant.

Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Arrol, Sir William & Co., Ltd. .. lxviiii
Brown Bros. & Co., Ltd. .. xiv

Ice Making Machinery.

Hall, J. & E., Ltd. xliii
Seagers, Ltd. xcvi

India-Rubber Goods.

North British Rubber Co., Ltd. .. lxvi
Reddaway, F. & Co., Ltd. lxxxviii

Indicators (Helm).

Evershed & Vignoles, Ltd. .. *inside front cover*

Indicators (Revolution).

Diamond Blower Co., Ltd. .. ciii
Molinari Pietro (*Italy*) lxxvii

Indicators (Speed).

Chadburn's (Ship) Telegraph Co., Ltd. lxxv
Diamond Blower Co., Ltd. .. ciii

Ironwork (Constructional).

Arrol, Sir William & Co., Ltd. .. lxviii
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix

Isherwood System of Ship Construction.

Isherwood, J. W. xxvii

Lamps (Arc).

General Electric Co. (*U.S.A.*) .. lxi

Lamps (Electric).

General Electric Co. (*U.S.A.*) .. lxi
McGeoch, William & Co., Ltd. .. xcix

Lamps (Marine).

McGeoch, William & Co., Ltd. .. xci

Lifeboats.

Seamless Steel Boat Co., Ltd. .. li

PAGE

Locomotives.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Officine Meccaniche (*Italy*) .. lx
Schichau, F. *Germany*) cxi

Lubricants.

Anglo-American Oil Co., Ltd. .. lxxxvii
Asiatic Petroleum Co., Ltd. .. lxxxvi
Dick, W. B. & Co., Ltd. .. lxxxvii
Vacuum Oil Co., Ltd. iii

Lubricating Boxes.

Cedervall & Söner (*Sweden*) .. lvii

Machine Tools.

Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Brown, John & Co., Ltd. xxvi
Coventry Ordnance Works, Ltd. xlii
Craig & Donald, Ltd. lxi
Drummond Bros., Ltd. lxv
General Engine & Boiler Co., Ltd. lxxxviii
Greenwood & Batley, Ltd. .. lxiv
Hulse & Co., Ltd. lxviii
Krupp, Fried. (*Germany*) xvii
Muir, Wm. & Co., Ltd. lxxvii
Niles-Bement-Pond Co. (*U.S.A.*) lxiii
Pratt & Whitney (*U.S.A.*) .. lxiii
Schiess, Ernst. (*Germany*) .. lxii
Vickers, Ltd. xxi

Model Construction.

Bassett-Lowke, Ltd. .. lxxxviii

Motor Boats.

Bergius Launch & Engine Co. .. li
Brazil, Straker & Co., Ltd. .. li
Brooke, J. W. & Co., Ltd. .. li
Fiat-San Giorgio, Ltd. (*Italy*) .. xxxv
Hamble River, Luke & Co., Ltd. .. lii
Normand, Augustin, Ltd. (*France*) xxxi
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Thornycroft, John I. & Co., Ltd. cv
White, J. Samuel & Co., Ltd. .. liv
Yarrow & Co., Ltd. lxxxv

CLASSIFIED LIST OF ADVERTISERS.—*Continued.*

PAGE

Motor Cars, Tractors, etc.

Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Hall, J. & E., Ltd. xliii
Thornycroft, John I. & Co., Ltd. cv
Vickers, Ltd. xxi
Wolseley Tool & Motor Car Co., Ltd. xlix

Motors (Electric).

Electromotors, Ltd. liii
General Electric Co. (*U.S.A.*) .. lxi
Greenwood & Batley, Ltd. .. lxiv
Vickers, Ltd. xxi

Motor Spirit.

Pratt's Perfection Motor Spirit lxxviii

Nautical Instruments.

Anschutz & Co. (*Germany*) .. lxxvi
Cambridge Scientific Instrument Co., Ltd. xcv
Chadburn's (Ship) Telegraph Co., Ltd. lxxv
Elliott Brothers lxxvi
General Electric Co. (*U.S.A.*) .. lxi
Hamble River, Luke & Co., Ltd. .. lii
Heath & Co., Ltd. lxxxix
Kelvin, Bottomley & Baird, Ltd. lxxviii
Ross, Ltd. civ
Schuette Recording Compass Co. (*U.S.A.*) xciv
Sperry Gyroscope Co. (*U.S.A.*) .. lxxix

Obsolete Vessels Buyers.

Ward, Thos. W. Ltd., *inside back cover* ..

Oil Cans.

Kaye, Joseph & Sons, Ltd. .. xciii

Oils (Fuel).

Anglo-American Oil Co., Ltd. lxxxvii
Asiatic Petroleum Co., Ltd. .. lxxxvi

Oil Fuel Systems.

Babcock & Wilcox, Ltd. liii
Kermodes, Ltd. lxxxvi
Thornycroft, John I. & Co., Ltd. cv
Wallsend Slipway & Engineering Co., Ltd. xxxiv

PAGE

Oils (Lubricating).

Anglo-American Oil Co., Ltd. lxxxvii
Asiatic Petroleum Co., Ltd. .. lxxxvi
Dick, W. B. & Co., Ltd. .. lxxxvii
Vacuum Oil Co., Ltd. iii

Opticians.

Chadburn's (Ship) Telegraph Co., Ltd., ... lxxv
Heath & Co., Ltd. lxxxix
Ross, Ltd. civ
Zeiss, Carl (London) Ltd. lxxx

Packing and Jointing.

Bennett Von der Heyde, J. .. xc
Dermatine Co., Ltd. xcv
"Dexine" Patent Packing and Rubber Co., Ltd. xcvi
Hulburd Engineering Co., Ltd. xcvii
Trist, Ronald & Co., Ltd. .. xciii

Paints, Varnishes, &c.

Burrell & Co., Ltd. xlv
Indestructible Paint Co., Ltd. .. cviii

Passenger & Cargo Boats.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W G., Whitworth & Co., Ltd. xvi
Beardmore, William & Co., Ltd. .. xxiii
Bethlehem Steel Corporation (*U.S.A.*) xviii
Bretagne, Ateliers et Chantiers (*France*) xli
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Fairfield Shipbuilding & Engineering Co., Ltd. xxxii
Fiat-San Giorgio, Ltd. (*Italy*) .. xxxv
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Krupp, Fried. (*Germany*) xvii
Orlando, Fratelli & C. (*Italy*) .. xxx
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Schichau, F. (*Germany*) cxi
Seattle Construction & Dry Dock Co. (*U.S.A.*) xxxi
Stabilimento Tecnico Triestino (*Austria*) xxxiii
Thornycroft, John I. & Co., Ltd. cv
Vickers, Ltd. xxi

PAGE

Photographers (Marine).

Cribb, Stephen ciii
Geiser, Jean (*Algiers*) xcix
Symonds & Co. xcviii

Pneumatic Tools.

Diamond Blower Co., Ltd. .. ciii

Projectiles.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Bethlehem Steel Corporation (*U.S.A.*) xviii
Bofors-Gullspang (*Sweden*) .. xxxvii
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Coventry Ordnance Works, Ltd. xlii
Firth, Thos. & Sons, Ltd. .. xl
Hadfield's Steel Foundry Co., Ltd. cvi
Marine & d'Homecourt, Forges des (*France*) xxxvi
Midvale Steel Co. (*U.S.A.*) xxxviii & xxxix
Schneider & Co. (*France*) xxiv
Sprengstoff A-G. Carbonit (*Germany*) xlvi
Vickers, Ltd. xxi

Propellers.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Thornycroft, John I. & Co., Ltd. cv

Publications.

"All the World's Aircraft" .. cii
"Naval & Military Record" .. ci
Sampson Low, Marston & Co., Ltd. c

Pumps.

Bethlehem Steel Corporation (*U.S.A.*) xviii
Brotherhood, Peter, Ltd. lxxi
Carruthers, J. H. & Co., Ltd. .. xlv
General Engine Boiler & Co., Ltd. lxxxviii
Greenwood & Batley, Ltd. .. lxiv
Merryweather & Sons, Ltd. .. xlviii
Mirrlees Watson & Co., Ltd. .. xxxiii
Sieve, Gorman & Co., Ltd. .. xx
Stone, J. & Co., Ltd. lxxiii

PAGE

Tosi, Franco (*Italy*) lvi
Warner, Robert & Co. (Engineers) Ltd. xxxv
Westinghouse Brake Co., Ltd. .. lix
Westinghouse Machine Co. (*U.S.A.*) lviii
Wilcox, W. H. & Co., Ltd. .. xliii

Pumps (Air).

Mirrlees Watson Co., Ltd. xxxiii
Westinghouse Machine Co. (*U.S.A.*) lviii

Rails.

Bethlehem Steel Corporation (*U.S.A.*) xviii
Cammell Laird & Co., Ltd. .. xix
Ebbw Vale Steel, Iron & Coal Co., Ltd. xcv
Marine & d'Homecourt, Forges des (*France*) xxxvi

Railway Engines.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Officine Meccaniche (*Italy*) .. lx
Schichau, F. (*Germany*) cxi

Railway Rolling Stock.

Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Officine Meccaniche (*Italy*) .. lx

Railway Carriages & Wagons.

Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Officine Meccaniche (*Italy*) .. lx

Railway Wheels, Tyres, Rails, Axles, &c.

Bethlehem Steel Corporation (*U.S.A.*) xviii
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Krupp, Fried. (*Germany*) xvii
Marine & d'Homecourt, Forges des (*France*) xxxvi
Vickers, Ltd. xxi

CLASSIFIED LIST OF ADVERTISERS.—*Continued.*

PAGE

Range Finders.

Barr & Stroud xci
Ross, Ltd. lxxxii
Zeiss, Carl (London) Ltd. lxxx

Refrigerating Machinery.

Hall, J. & E., Ltd. .. xliii
Seagers, Ltd. xcvi

Rifles and Revolvers.

Webley & Scott, Ltd. xliv

Ropes (Wire).

Bullivant & Co., Ltd. cx
Newall, R. S. & Son, Ltd. xlviii
Smith, Thos. & Wm., Ltd. .. lxviii

Searchlights.

Brazil, Straker & Co., Ltd. .. li
General Electric Co. (*U.S.A.*) .. lxi
Zeiss, Carl (London) Ltd. lxxx

Shafting.

Ansaldo, Gio. & Co., (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Beardmore, William & Co., Ltd. .. xxiii
Bofors-Gullspang (*Sweden*) .. xxxvii
Brown, John & Co., Ltd. xxvi
Darlington Forge Co., Ltd. .. xv
Dennystown Forge Co. xiii
Midvale Steel Co. (*U.S.A.*) xxxviii & xxxix
Rotherham Forge & Rolling Mills Co., Ltd. xcvi
Schichau, F. (*Germany*) cxi
Somers, Walter & Co., Ltd. .. lxxxi

Ship Lighting Plant and Accessories.

Brazil, Straker & Co., Ltd. .. li
Brooke, J. W. & Co., Ltd. .. li
General Electric Co. (*U.S.A.*) .. lxi
McGeoch, William & Co., Ltd. .. xcix
Simplex Conduits, Ltd. ci
Thornycroft, John I. & Co., Ltd. cv
Westinghouse Brake Co., Ltd. .. lix
Wyss, Escher & Co. (*Switzerland*) lx

PAGE

Ship-Logs.

Walker, Thomas & Son, Ltd. .. lv

Ship Repairs.

Ansaldo, Gio & Co. (*Italy*) .. xxv
Bethlehem Steel Corporation (*U.S.A.*) xviii
Cammell Laird & Co., Ltd. .. xix
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Seattle Construction & Dry Dock Co. (*U.S.A.*) xxxi
Stabilimento Tecnico Triestino (*Italy*) xxxiii
Wallsend Slipway & Engineering Co., Ltd. xxxiv

Ships' Auxiliary Machinery.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Brazil, Straker & Co., Ltd. .. li
Brotherhood, Peter, Ltd. lxxi
General Electric Co. (*U.S.A.*) .. lxi
Westinghouse Brake Co., Ltd. .. lix
Westinghouse Machine Co. (*U.S.A.*) lviii

Ship Stabilizers.

Sperry Gyroscope Co. (*U.S.A.*) .. lxxix

Signalling Systems and Apparatus

Eversheds & Vignoles, Ltd. *inside front cover*
McGeoch, William & Co., Ltd. .. xcix
Zeiss, Carl (London) Ltd. lxxx

Sound Signals.

Downie, T. & Co. lxxiv

Sounding Machines.

Heath & Co., Ltd. lxxxix
Kelvin, Bottomley & Baird, Ltd. .. lxxviii

Steel Founders.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi

PAGE

Beardmore, William & Co., Ltd. .. xxiii
Bethlehem Steel Corporation (*U.S.A.*) xviii
Bofors-Gullspang (*Sweden*) .. xxxvii
Braintree Castings Co. xcii
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Darlington Forge Co., Ltd. .. xv
Dennystown Forge Co. xiii
Ebbw Vale Steel, Iron & Coal Co., Ltd. xcv
Firth, Thos. & Sons, Ltd. .. xl
Hadfield's Steel Foundry Co., Ltd. cvi
Krupp, Fried. (*Germany*) xvii
Marine & d'Homecourt, Forges des (*France*) xxxvi
Midvale Steel Co. (*U.S.A.*) xxxviii & xxxix
Park Gate Iron & Steel Co., Ltd. l
Rotherham Forge & Rolling Mills Co., Ltd. xcvi
Schichau, F. (*Germany*) cxi
Somers, Walter & Co., Ltd. .. lxxxi

Steel Plates, Sheets, Bars, Rods, &c.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Beardmore, William & Co., Ltd. .. xxiii
Bethlehem Steel Corporation (*U.S.A.*) xviii
Ebbw Vale Steel, Iron & Coal Co., Ltd. xcv
Hadfield's Steel Foundry Co., Ltd. cvi
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Krupp, Fried. (*Germany*) xvii
Marine & d'Homecourt, Forges des (*France*) xxxvi
Midvale Steel Co. (*U.S.A.*) xxxviii & xxxix
Orlando Fratelli & Co. (*Italy*) .. xxx
Park Gate Iron & Steel Co., Ltd. l
Rotherham Forge & Rolling Mills Co., Ltd. xcvi

Steel Rolling Shutters.

Gibson, Arthur L. & Co. .. lxxxii

PAGE

Steering Gear, &c.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Brown Bros. & Co., Ltd. .. xiv
Hastie, John & Co, Ltd. lxxii

Stocks, Dies and Taps.

Widdowson, John H. xc

Submarines.

Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Bethlehem Steel Corporation (*U.S.A.*) xviii
Bretagne, Ateliers et Chantiers (*France*) xli
Electric Boat Co. (Holland Submarines) (*U.S.A.*) xli
Fiat-San Giorgio, Ltd. (*Italy*) .. xxxv
Krupp, Fried. (*Germany*) xvii
Normand, Augustin, Ltd. (*France*) xxxi
Orlando, Fratelli & Co. (*Italy*) .. xxx
Schneider & Co. (*France*) xxiv
Vickers, Ltd. xxi

Superheaters.

Niclausse, Jo. & A. (*France*) .. lxxxiv
Yarrow & Co., Ltd. lxxxv

Switchboards.

General Electric Co. (*U.S.A.*) .. lxi

Telegraphs (Ship).

Chadburn's (Ship) Telegraph Co., Ltd. lxxv
Eversheds & Vignoles, Ltd. *inside front cover*

Telephones (Loud Speaking).

Graham, Alfred & Co. xliii

Testing Machines.

Greenwood & Batley, Ltd. .. lxiv

CLASSIFIED LIST OF ADVERTISERS.—*Continued.*

PAGE

Tool Steel and Files.

Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Cammell Laird & Co., Ltd. .. xix
Marine & d'Homecourt, Forges des (*France*) xxxvi

Torpedo Craft Builders.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Bethlehem Steel Corporation (*U.S.A.*) xviii
Bretagne, Ateliers et Chantiers (*France*) xli
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Fairfield Shipbuilding & Engineering Co., Ltd. xxxii
Fiat-San Giorgio, Ltd. (*Italy*) .. xxxv
Krupp, Fried. (*Germany*) xvii
Normand, Augustin, Ltd. (*France*) xxxi
Orlando, Fratelli & Co. (*Italy*) .. xxx
Pattison, C. & T. T. (*Italy*) .. xxviii
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Schichau, F. (*Germany*) cxi
Schneider & Co. (*France*) xxiv
Stabilimento Tecnico Triestino (*Austria*) xxxiii
Thornycroft, John I. & Co., Ltd. cv
White, J. Samuel & Co., Ltd. .. liv
Yarrow & Co., Ltd. lxxxv

Torpedoes.

Berliner Maschinenbau A-G. (*Germany*) xlvi
Greenwood & Batley, Ltd. .. lxiv
Schneider & Co. (*France*) xxiv

Torpedo Nets and Defences.

Bullivant & Co., Ltd. cx

PAGE

Tubes.

Ebbw Vale Steel, Iron & Coal Co., Ltd. xcv
Yorkshire Copper Works, Ltd. .. xiii

Tubing (Flexible Metallic).

Interlock Metal Hose Co. xc, xcii, xcvii & xcviii
United Flexible Metallic Tubing Co., Ltd. cix

Tugs, etc.

Bretagne, Ateliers et Chantiers (*France*) xli
Brooke, J. W. & Co , Ltd. .. li
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Vickers, Ltd. xxi

Turbines.

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Beardmore, William & Co., Ltd. .. xxiii
Bretagne, Ateliers et Chantiers (*France*) xli
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Fairfield Shipbuilding & Engineering Co., Ltd. xxxii
General Electric Co. (*U.S.A.*) .. lxi
Greenwood & Batley, Ltd. .. lxiv
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Krupp, Fried. (*Germany*) xvii
Officine Meccaniche (*Italy*) .. lx
Orlando Fratelli & Co. (*Italy*) .. xxx
Parsons Marine Steam Turbine Co., Ltd. xii
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Schichau, F. (*Germany*) cxi
Schneider & Co. (*Germany*) .. xxiv
Stabilimento Tecnico Triestino (*Austria*) xxxiii

PAGE

Thornycroft, John I. & Co., Ltd. cv
Tosi, Franco (*Italy*) lvi
Vickers, Ltd. liv
Westinghouse Machine Co. (*U.S.A.*) lviii
White, J. Samuel & Co., Ltd. .. liv
Wyss, Escher & Co., Ltd. (*Switzerland*) lx

Turbine Gears.

Power Plant Co., Ltd. xcii
Westinghouse Machine Co. (*U.S.A.*) lviii

Valves.

Auld, David & Sons, Ltd. .. xli
Cockburns, Ltd. xcvi
Dermatine Co., Ltd. xcv
Downie, T. & Co. lxxiv
Hulburd Engineering Co., Ltd. .. xcvii
Metallic Valve Co. lii

Valve Re-seating Machines.

Greenwood & Batley, Ltd. .. lxiv

Ventilating & Heating.

General Electric Co. (*U.S.A.*) .. lxi
Greenwood & Batley, Ltd. .. lxiv
Keith, James & Blackman Co., Ltd. lvii
Matthews & Yates, Ltd. xcvii
Niclausse, Jo. & A. (*France*) .. lxxxiv
Simplex Conduits, Ltd. ci
Smith & Wellstood, Ltd. xciv
Westinghouse Brake Co., Ltd. .. lix

Warships (large).

Ansaldo, Gio. & Co. (*Italy*) .. xxv
Armstrong, Sir W. G., Whitworth & Co., Ltd. xvi
Beardmore, William & Co., Ltd. .. xxiii
Bethlehem Steel Corporation (*U.S.A.*) xviii
Brown, John & Co., Ltd. xxvi
Cammell Laird & Co., Ltd. .. xix
Fairfield Shipbuilding & Engineering Co., Ltd. xxxii

PAGE

Fiat-San Giorgio, Ltd. (*Italy*) .. xxxv
Kawasaki Dockyard Co., Ltd. (*Japan*) xxix
Krupp, Fried. (*Germany*) xvii
Orlando, Fratelli & Co. (*Italy*) .. xxx
Pattison, C. & T. T. (*Italy*) .. xxviii
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Schichau, F. (*Germany*) cxi
Schneider & Co. (*France*) xxiv
Stabilimento Tecnico Triestino (*Austria*) xxxiii
Vickers, Ltd. xxi

Waterproof and Fireproof Boards.

Venesta, Ltd. xcix

Welding Outfits.

Thorn & Hoddle Acetylene Co., Ltd. xciv

Wire Cutters.

Bullivant & Co., Ltd. cx

Yachts, Launches, etc.

Bergius Launch & Engine Co. .. li
Bretagne, Ateliers et Chantiers (*France*) xli
Brooke, J. W. & Co., Ltd. .. li
Fiat-San Giorgio, Ltd. (*Italy*) .. xxxv
Hamble River, Luke & Co., Ltd. .. lii
Normand, Augustin, Ltd. (*France*) xxxi
Orlando, Fratelli & Co. (*Italy*) .. xxx
St. Nazaire, Chantiers et Ateliers (*France*) xxii
Schichau, F. (*Germany*) cxi
Seamless Steel Boat Co., Ltd. .. li
Stabilimento Tecnico Triestino (*Austria*) xxxiii
Thornycroft, John I. & Co., Ltd. .. cv
Vickers, Ltd. xxi
White, J. Samuel & Co., Ltd. .. liv

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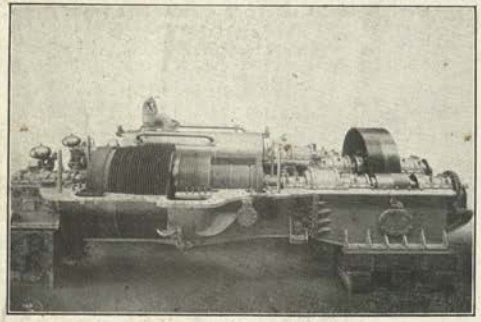

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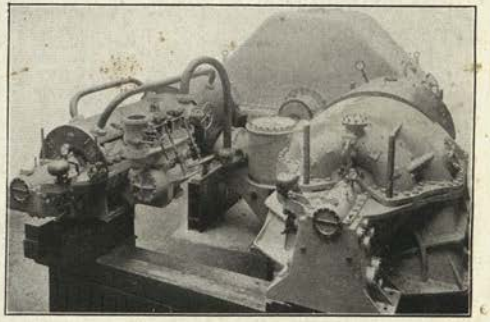

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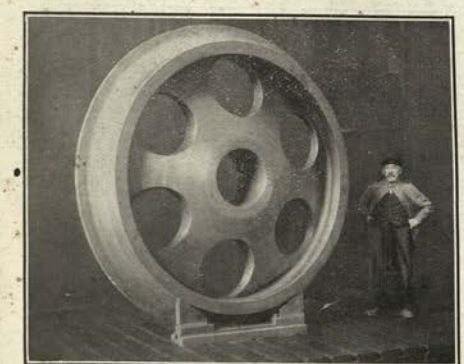

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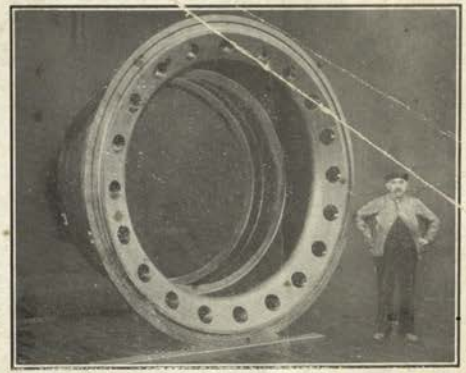

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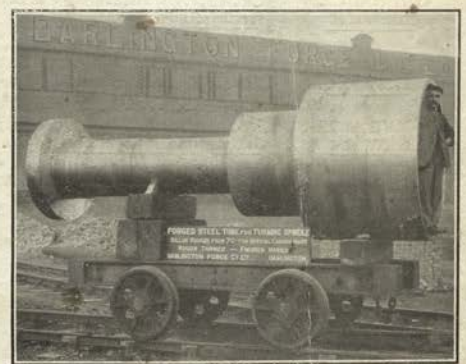

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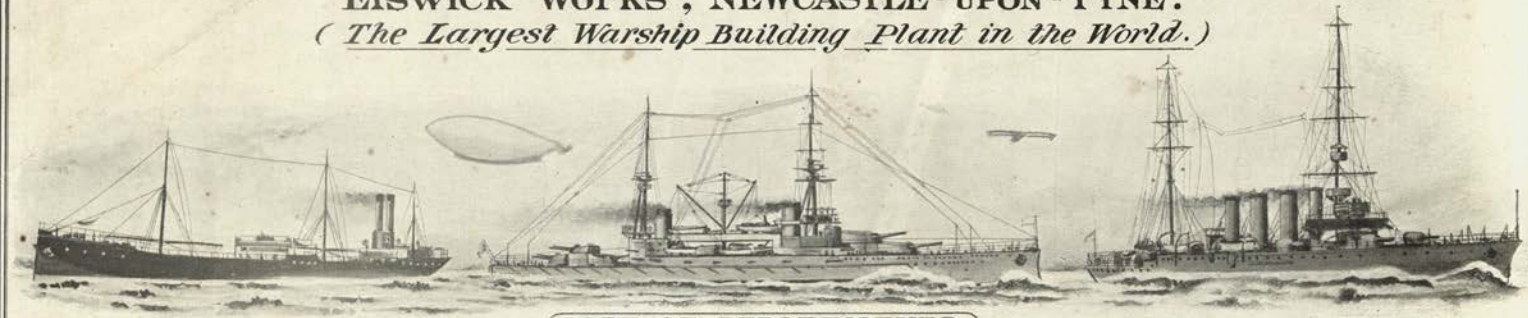

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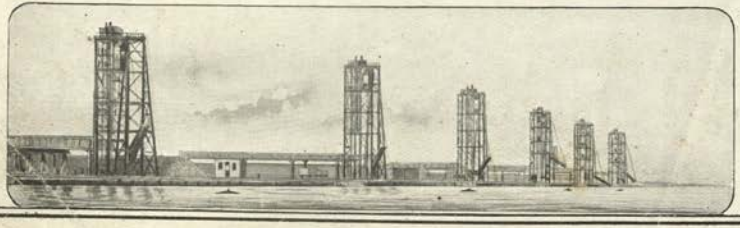

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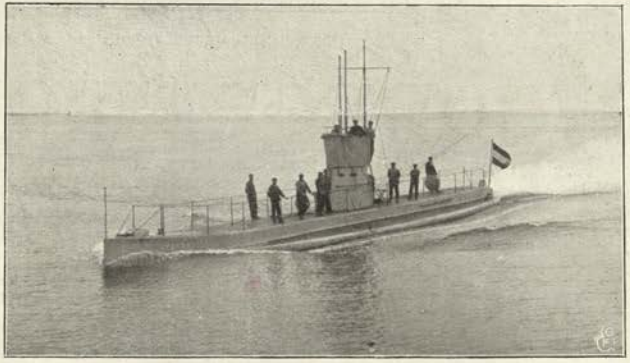

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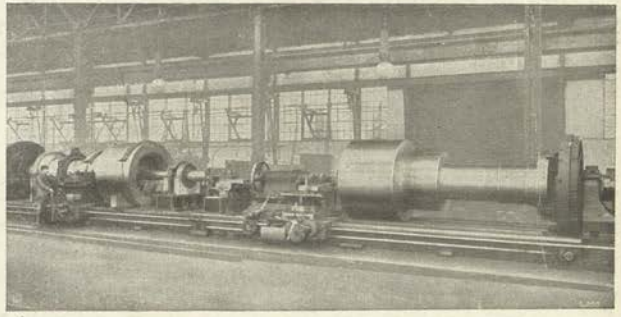

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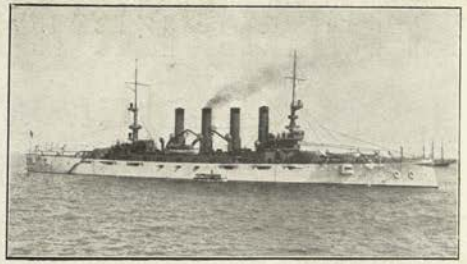

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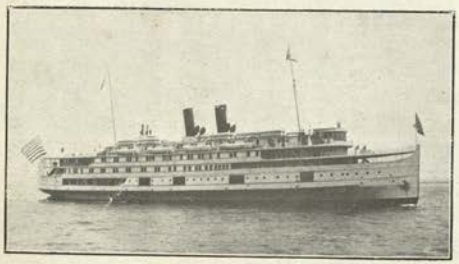

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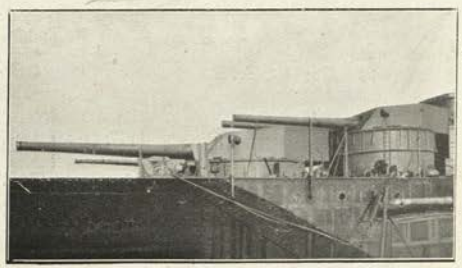

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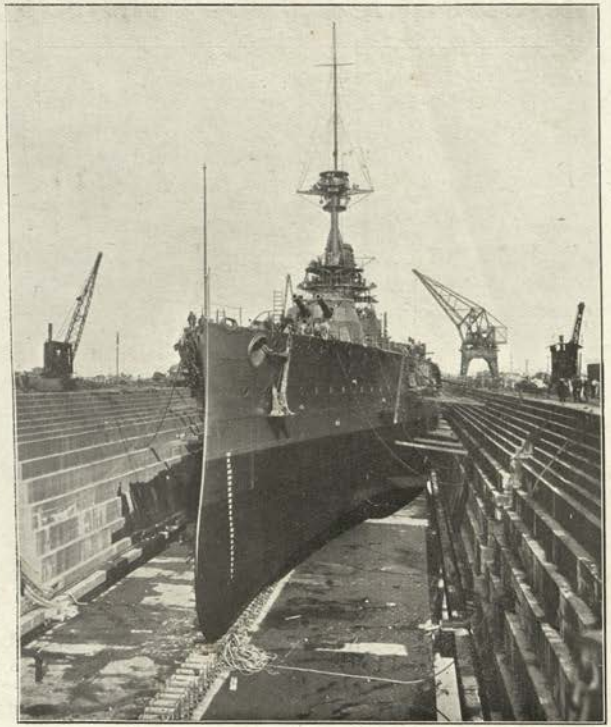

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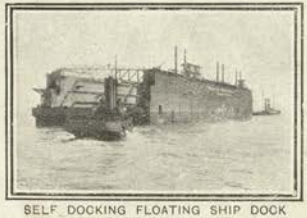

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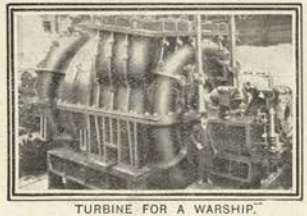

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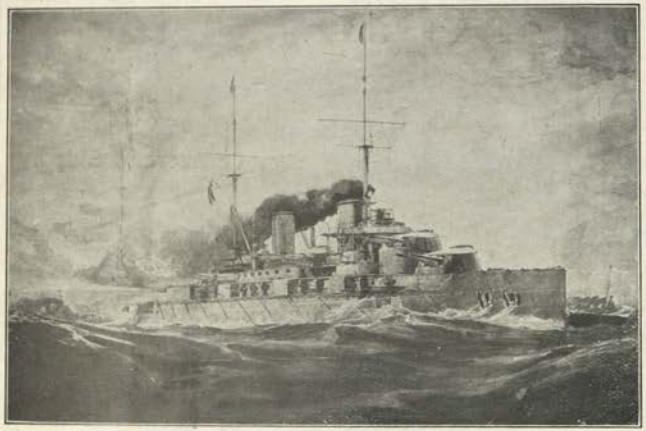

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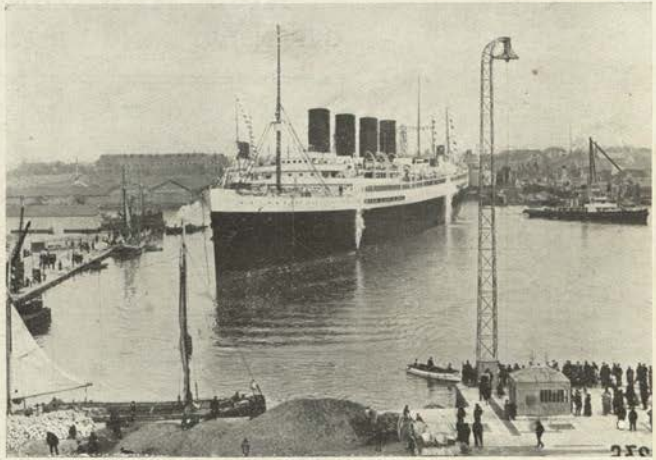

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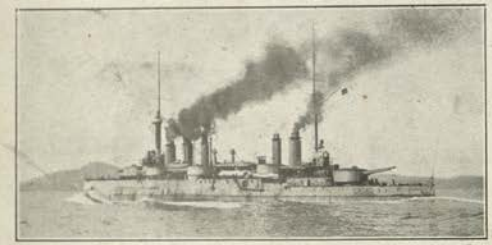

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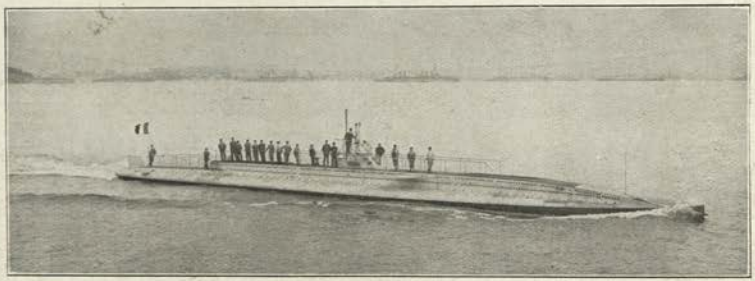

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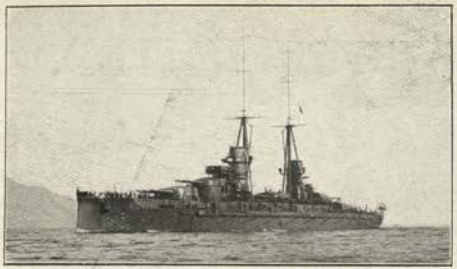

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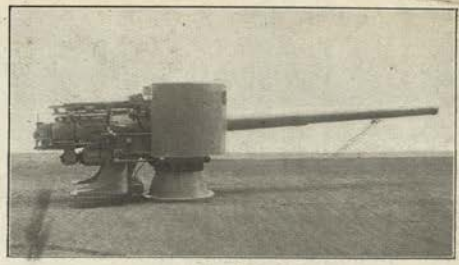

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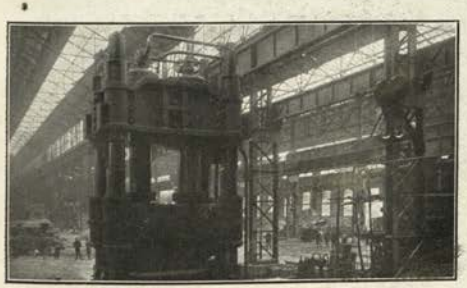

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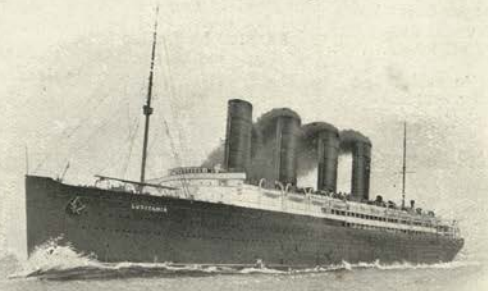

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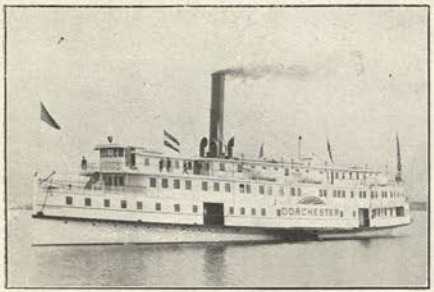
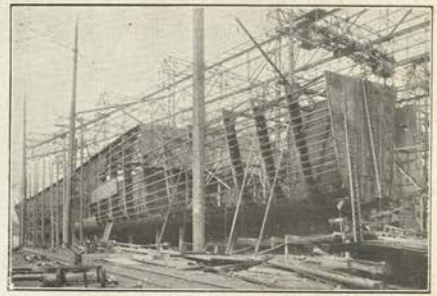


P.S. *Dorchester*, one of several light draught high powered passenger steamers.



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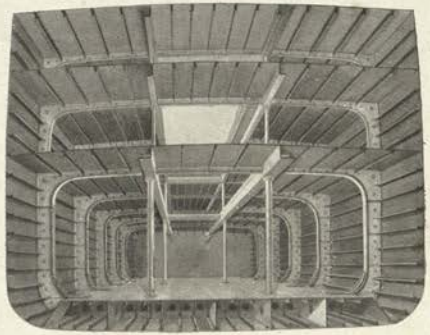
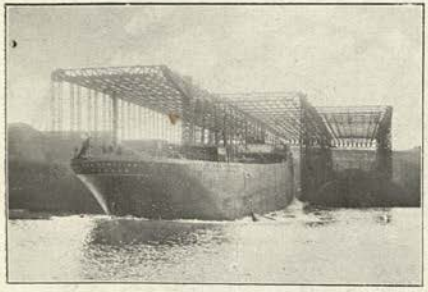
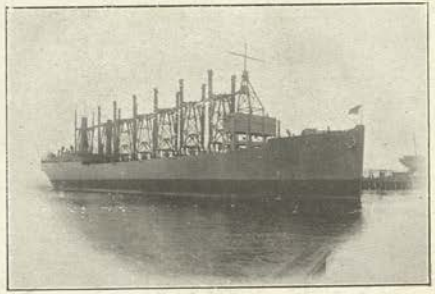


Internal view of S.S. *Maidan*, 12,500 tons d.w. cargo steamer, shewing Isherwood Construction.

288 vessels built and being built, representing 1,310,000 gross register tons, including 108 Oil Tankers, representing 656,000 gross register tons.



Launch of S.S. *San Jeronimo*, 15,000 tons d.w. oil tanker, chartered by the British Admiralty.



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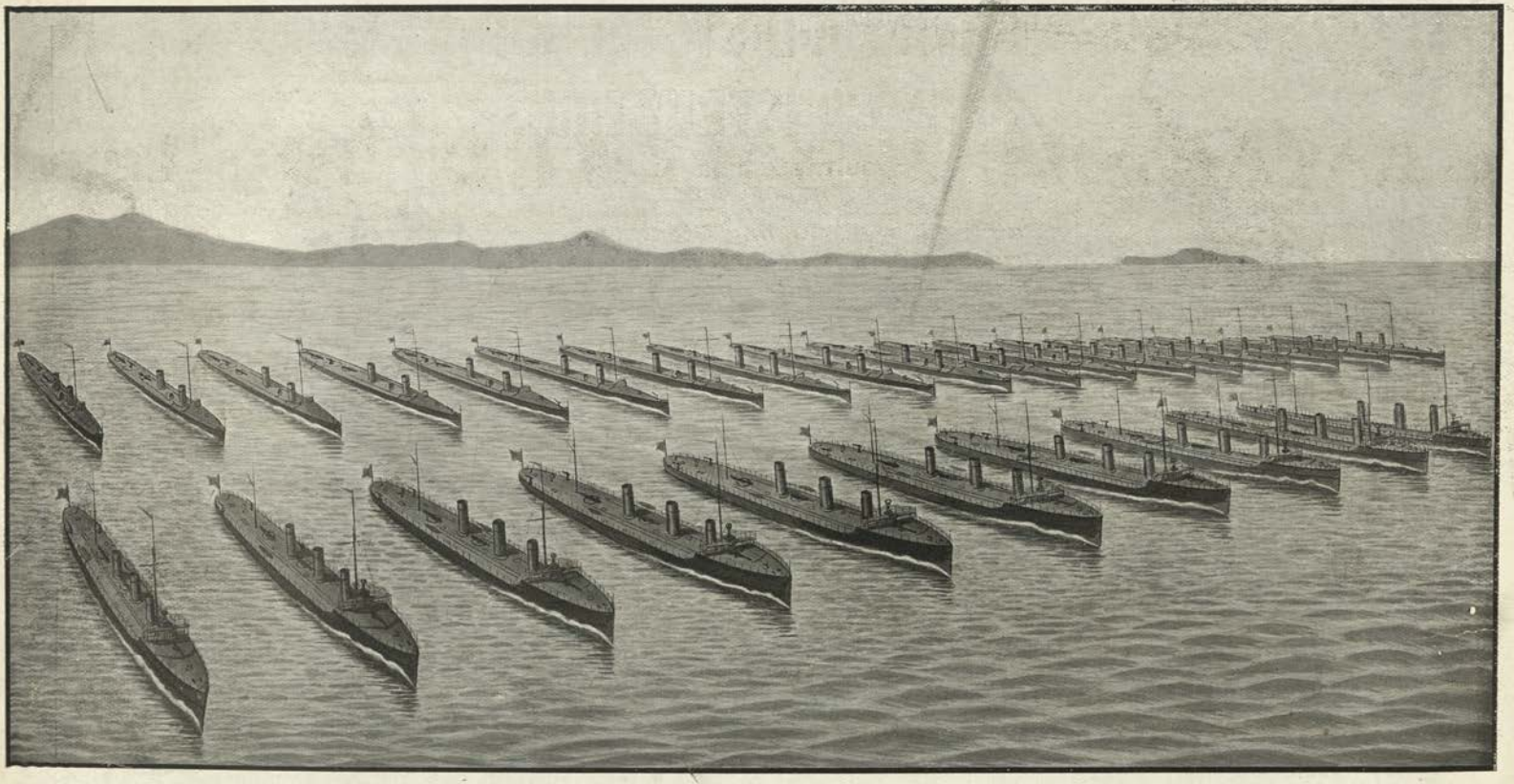

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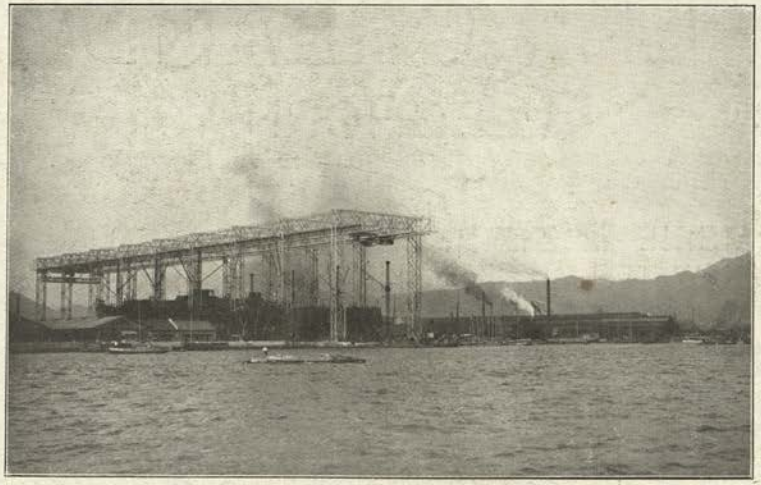

A View of Battle-Cruiser HARUNA (27,500 tons) under Construction.

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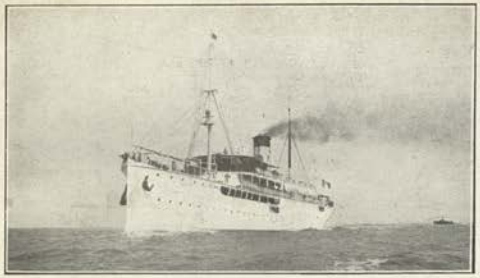

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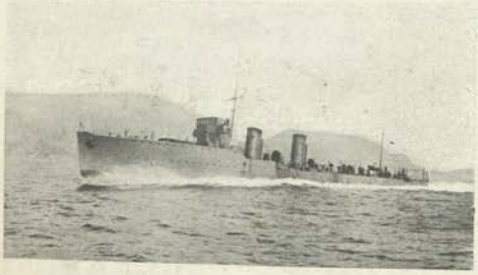

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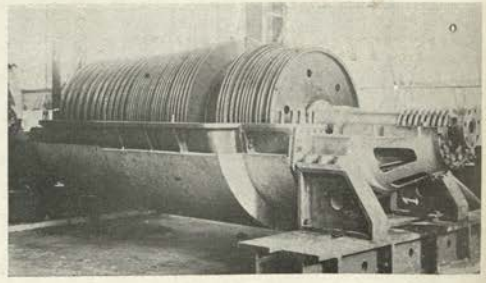

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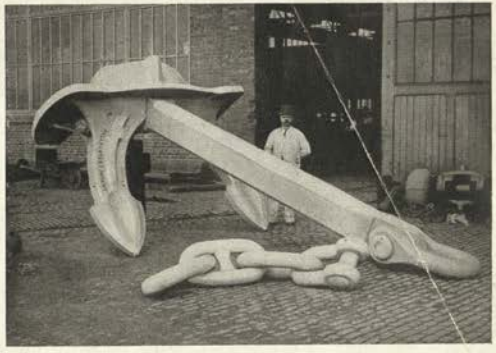

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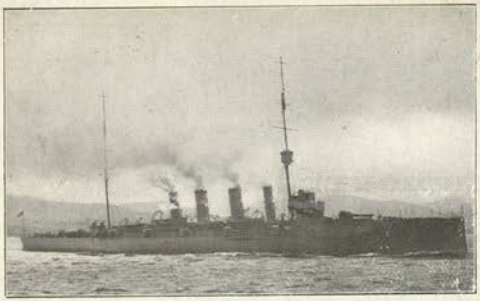

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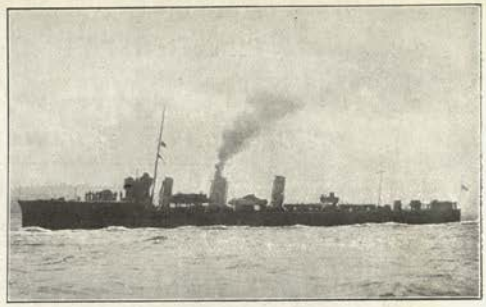

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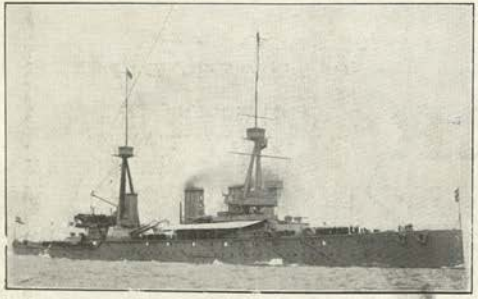

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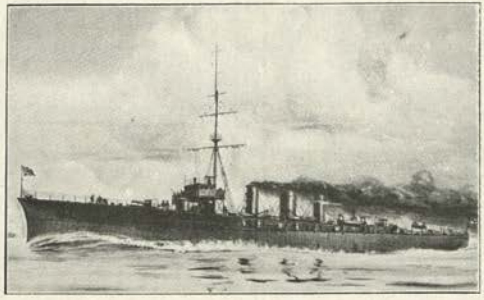

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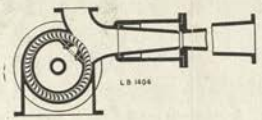

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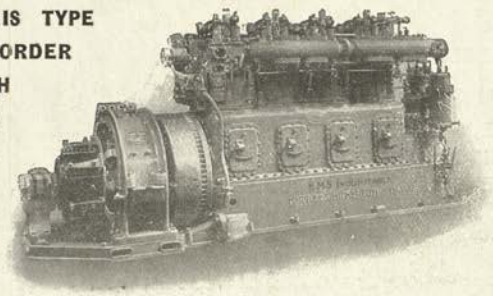

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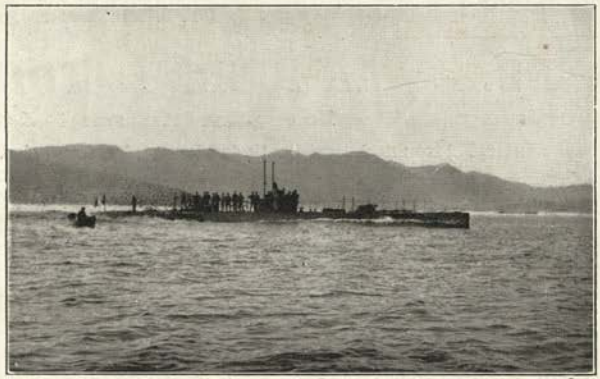

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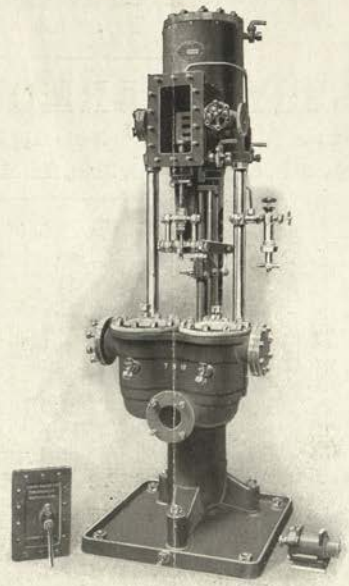

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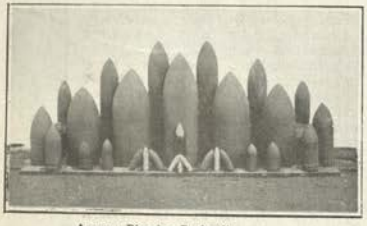
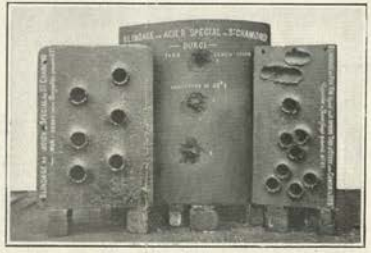
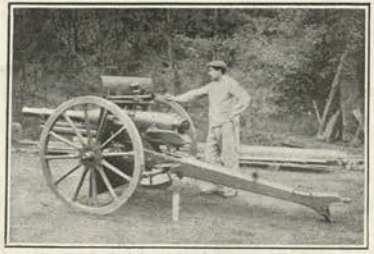


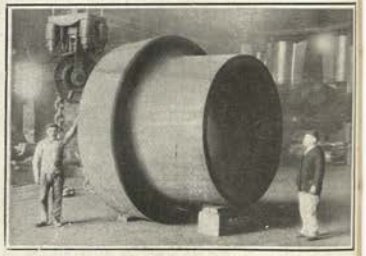
Armour Piercing Projectiles.



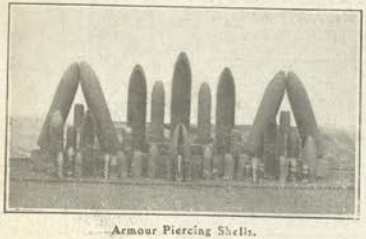
Plates after Attack.



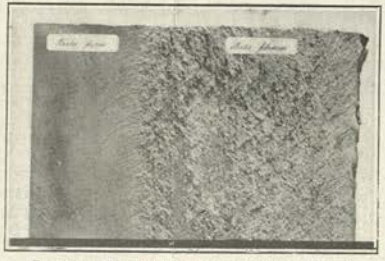
75 m/m Q.F. Field Gun.



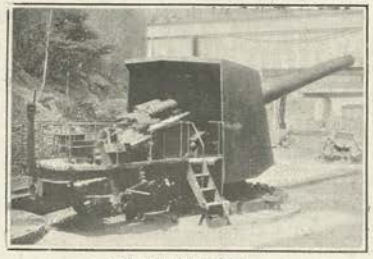
Turbine Casing (Forged Steel).



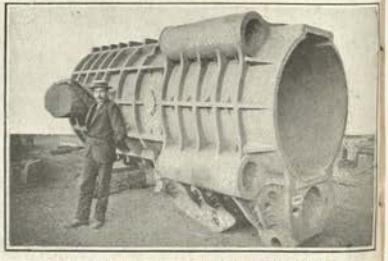
Armour Piercing Shells.



Fracture of a Special Steel Armoured Plate (Metal 33).



240 m/m Coast Gun.



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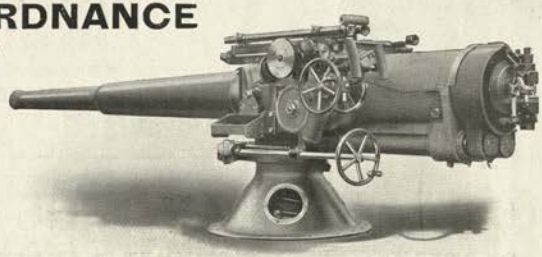

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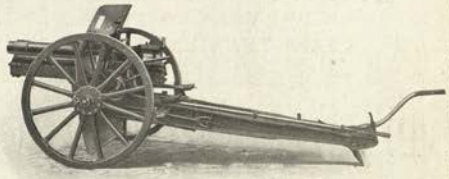

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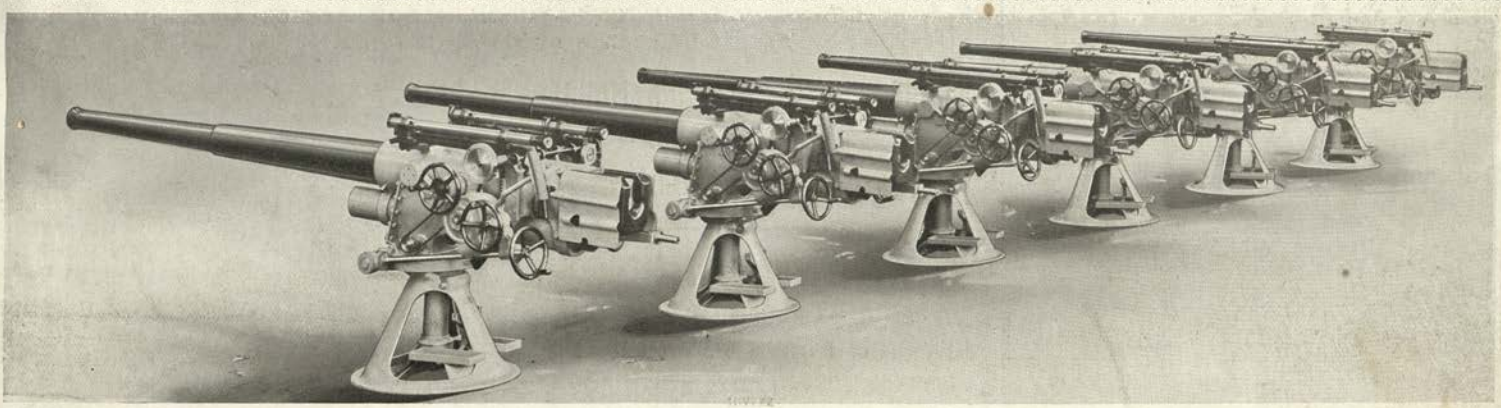

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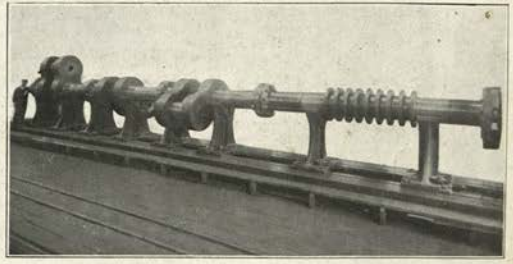

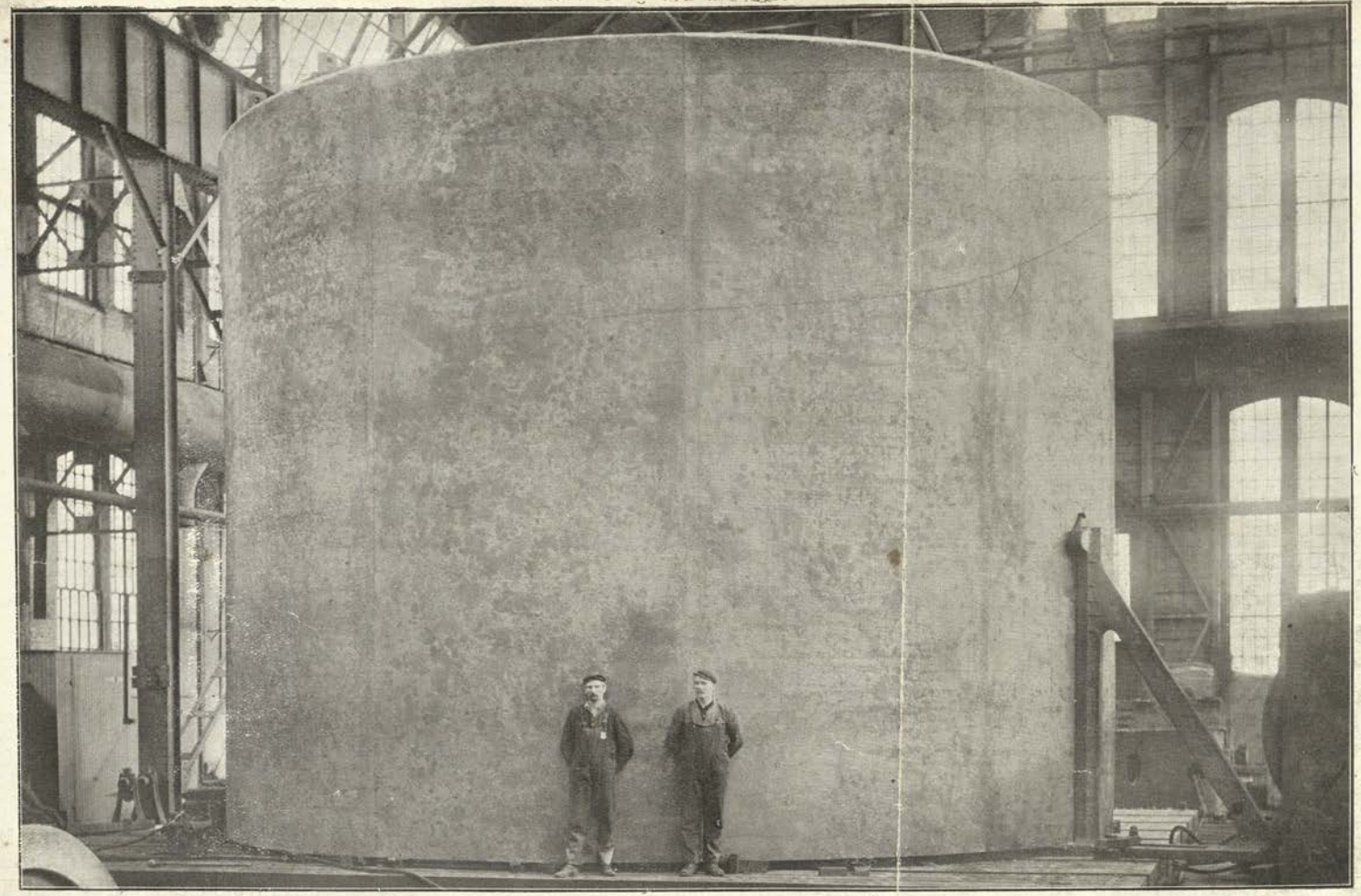

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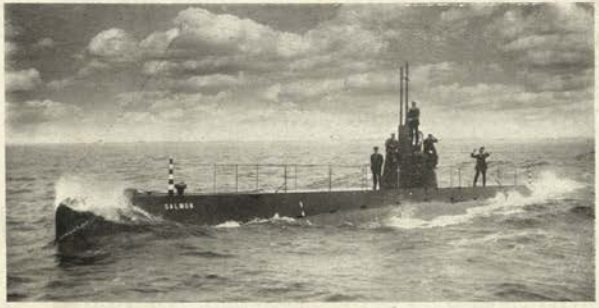

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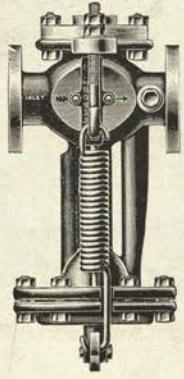

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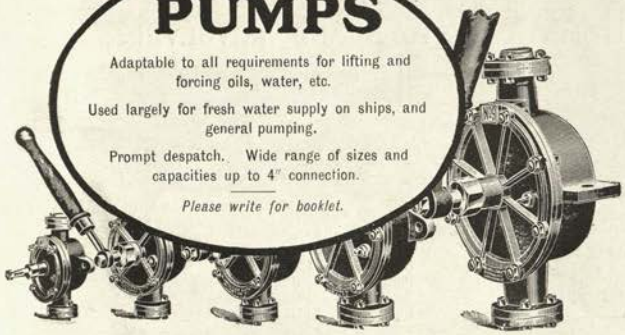

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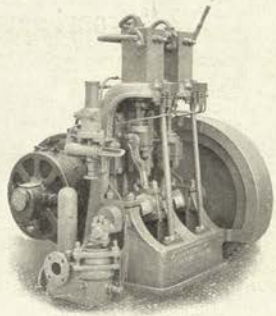

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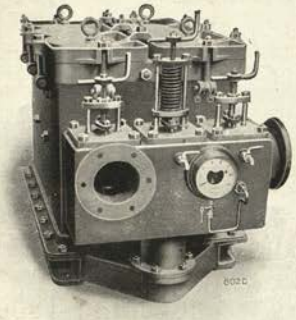

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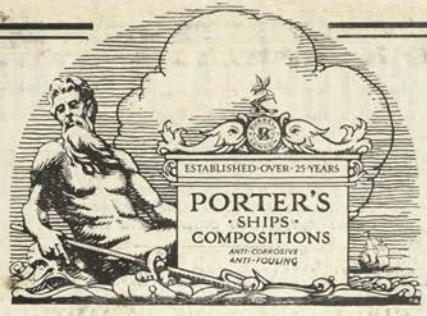

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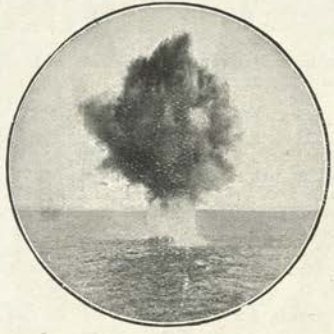

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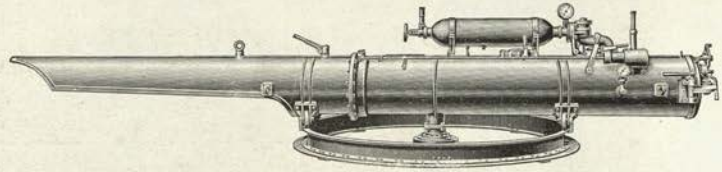

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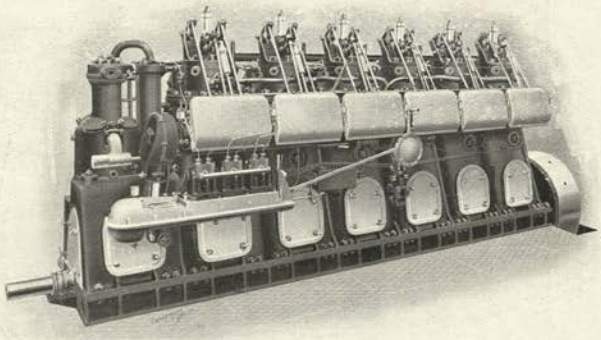

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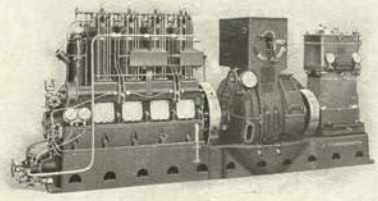

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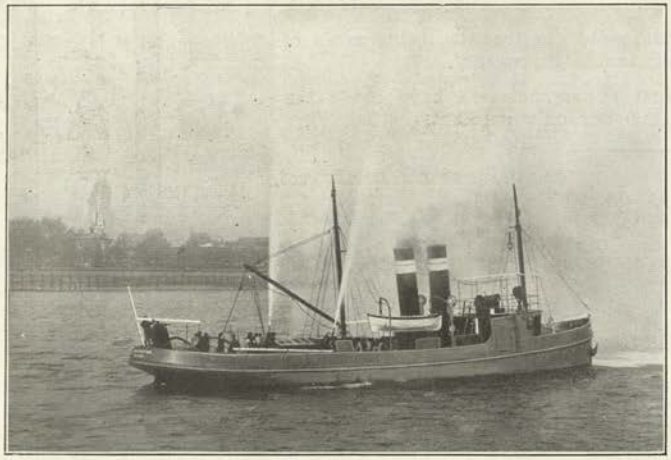

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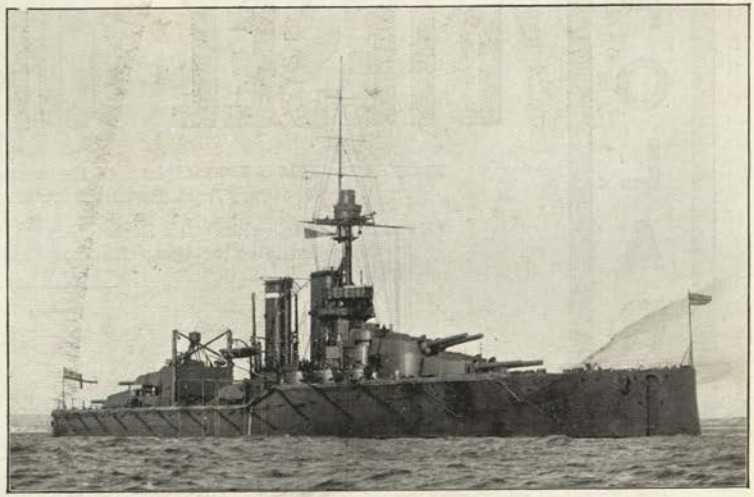

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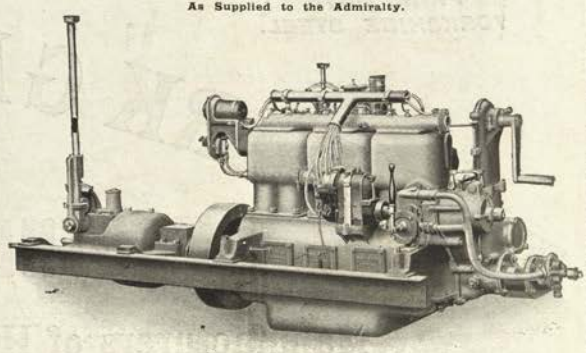

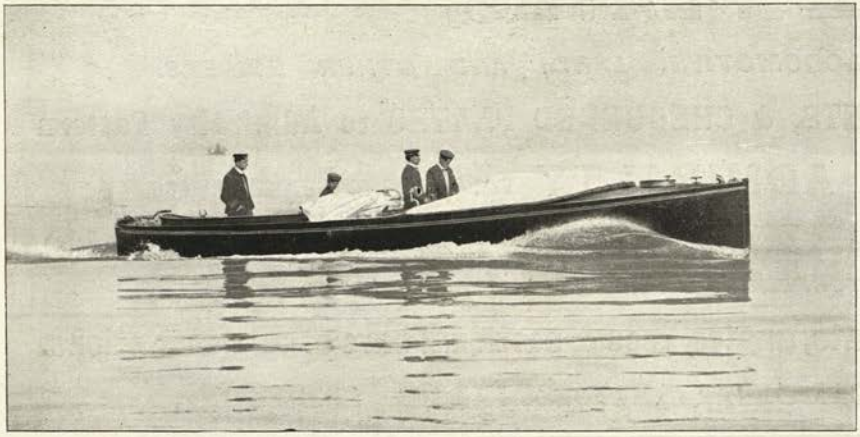

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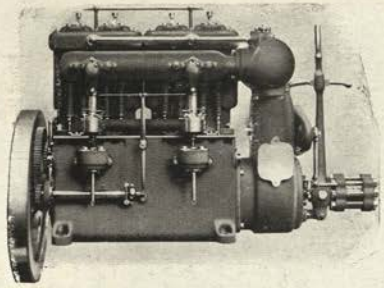

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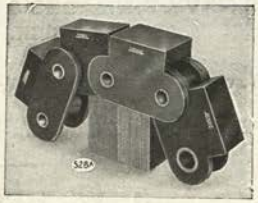

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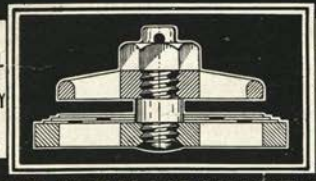

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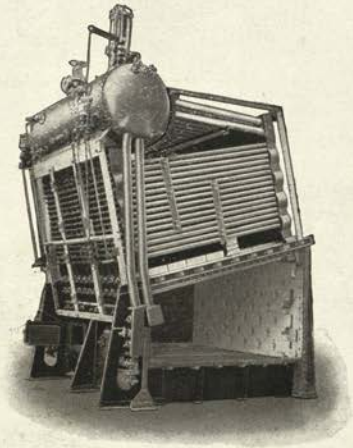

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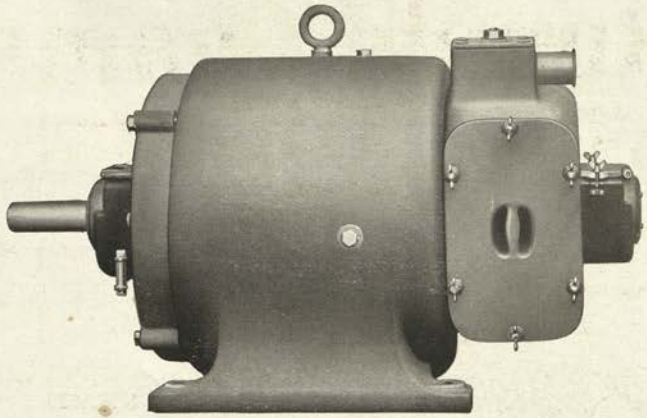

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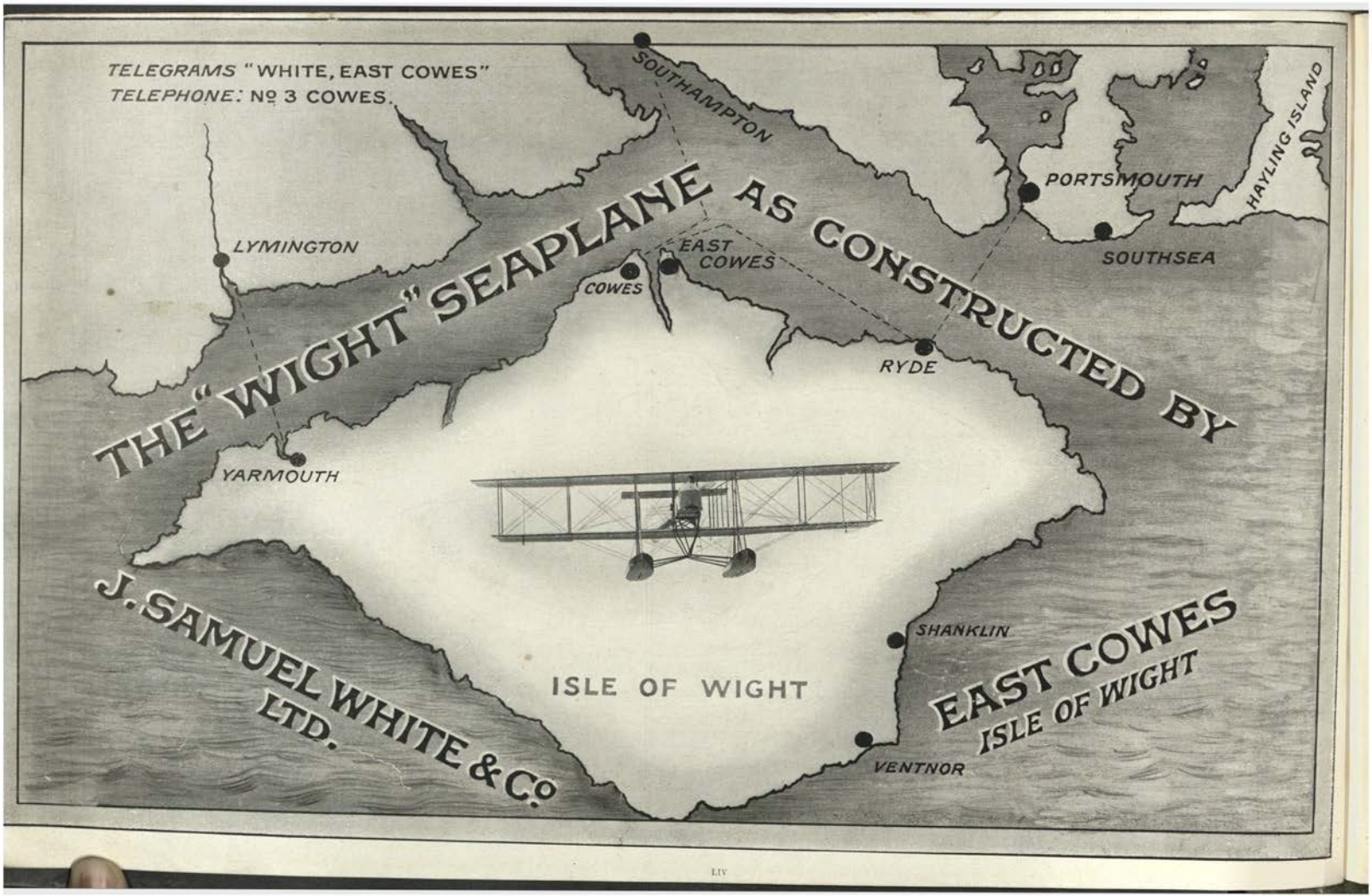
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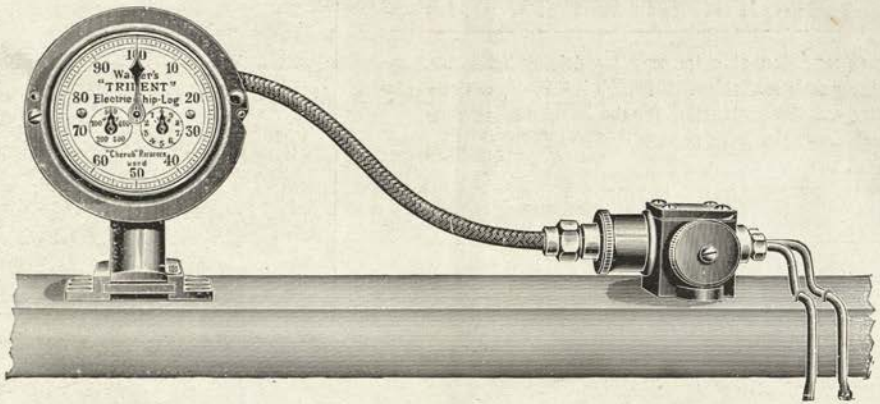
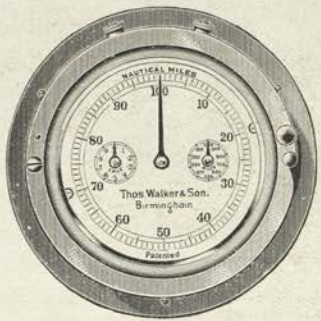


TAFFRAIL REGISTER AND CONNECTION BOX.



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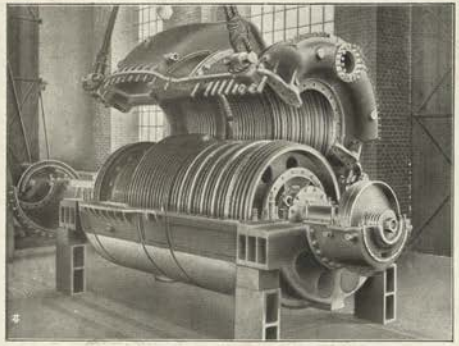

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For the propulsion of ships and for driving Auxiliary Machinery on board ships. (560,000 B.H.P. of turbines supplied and in construction for the Royal Italian and Roumanian Navies, with units of 9,000 to 20,000 B.H.P.)

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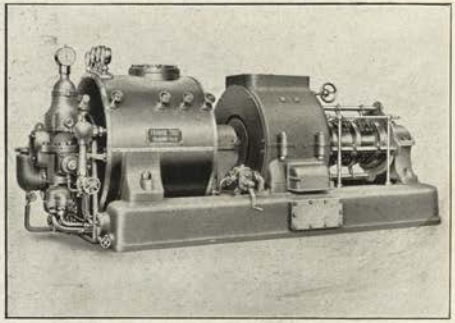

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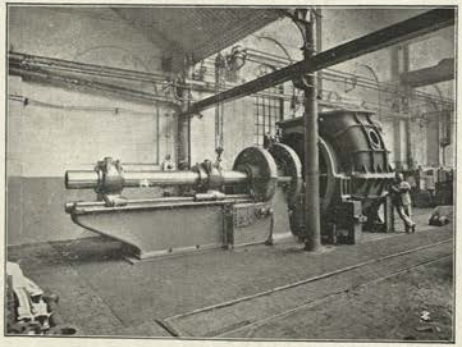

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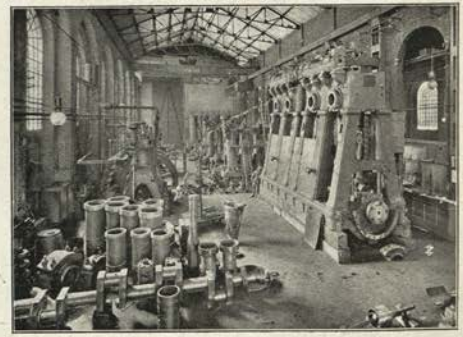

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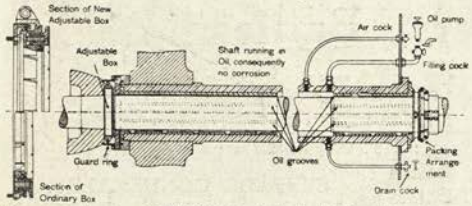

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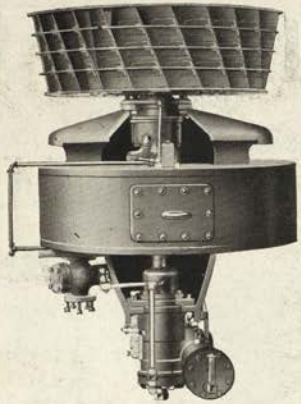

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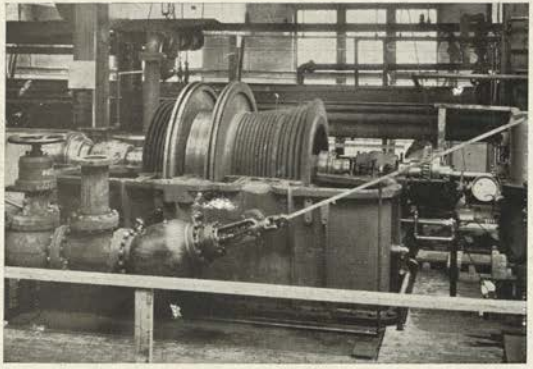

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No Vibration.
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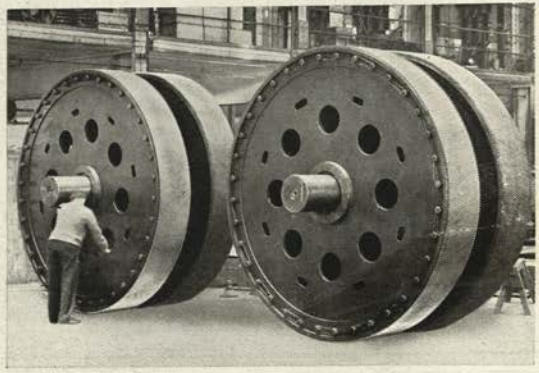

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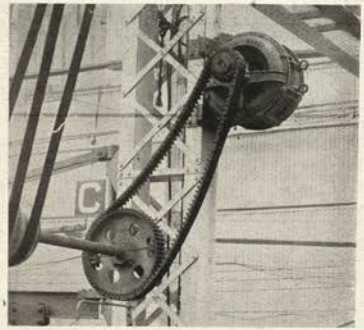

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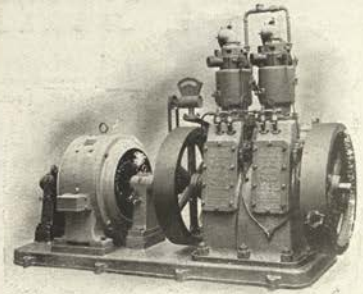

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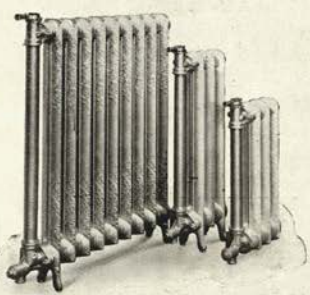

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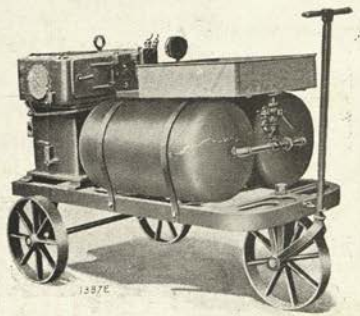

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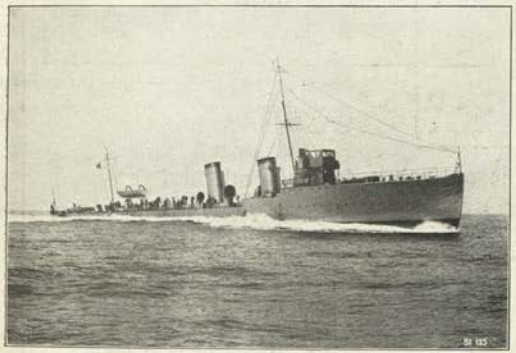

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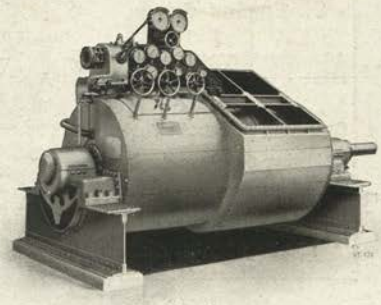

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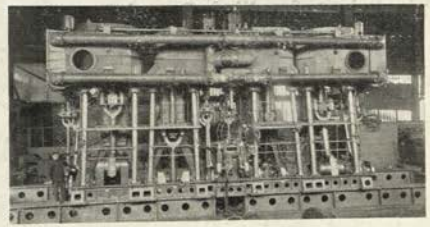
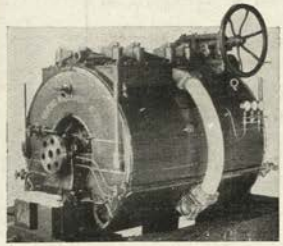


Engines for the Italian Warship "NAPOLI."



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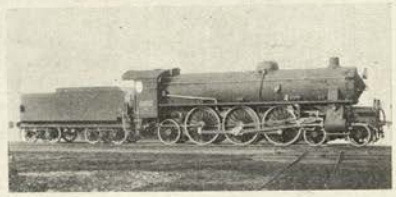

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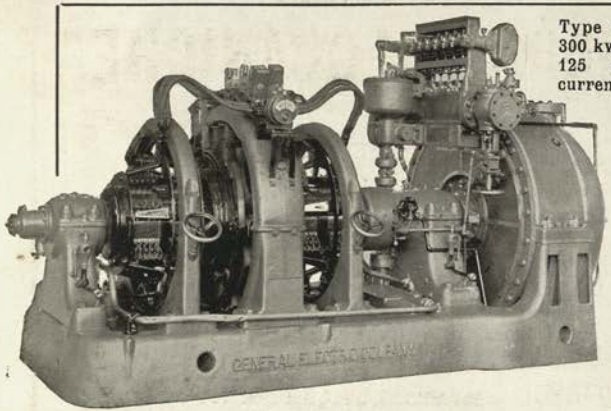

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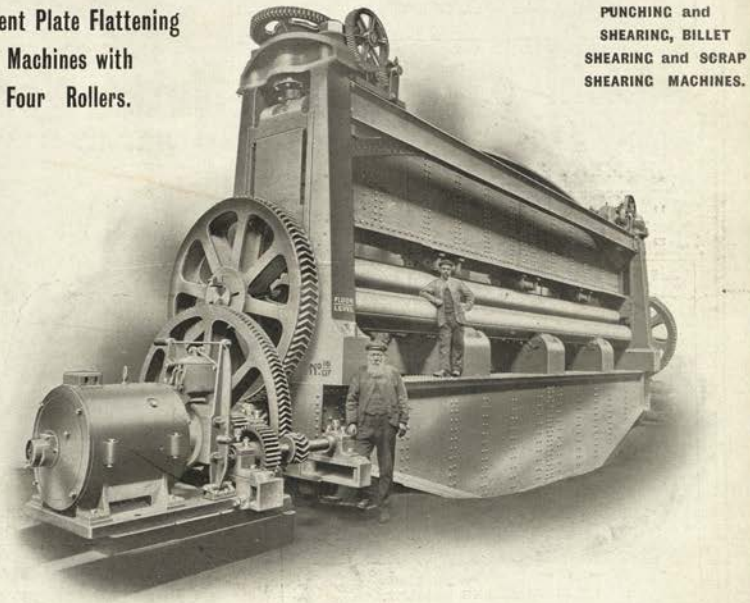

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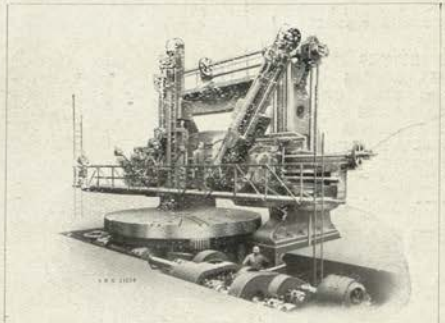

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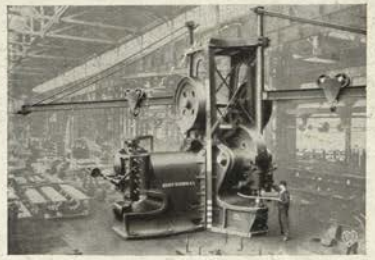

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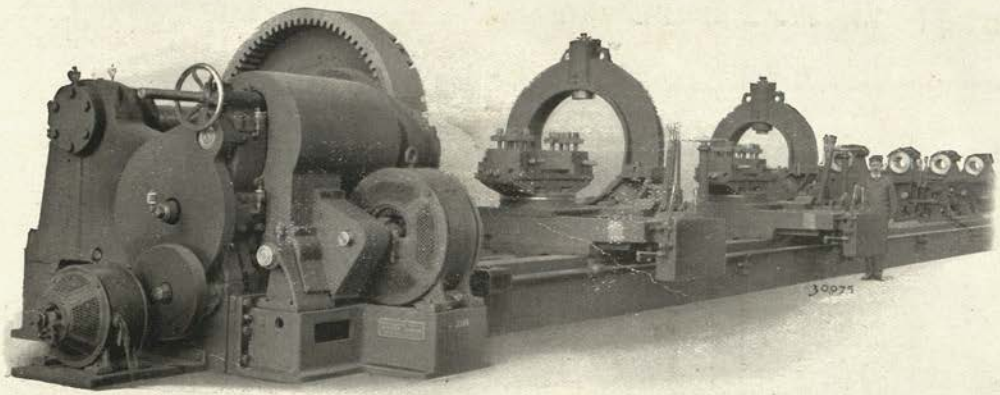

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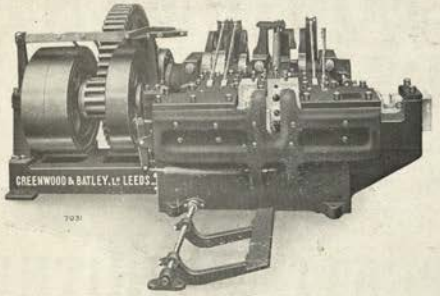

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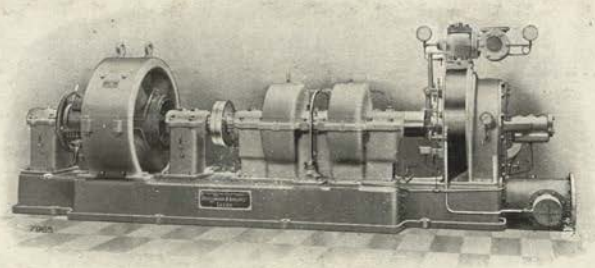

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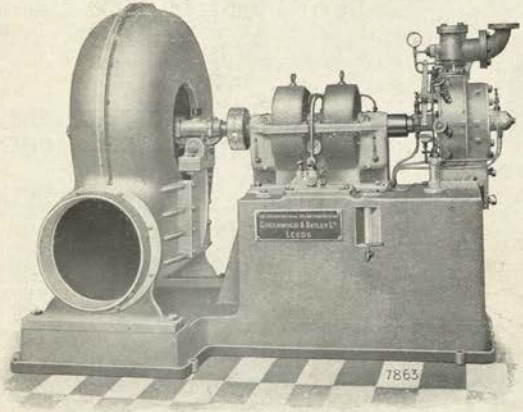

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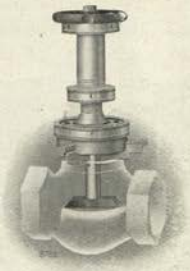

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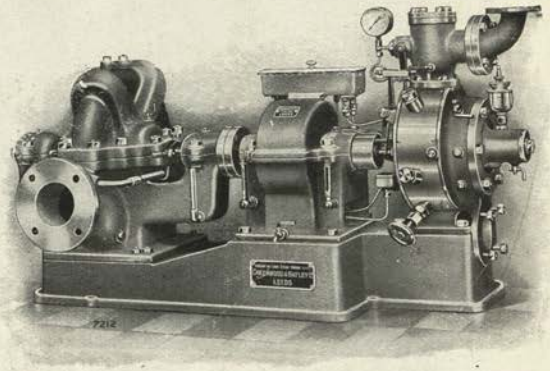

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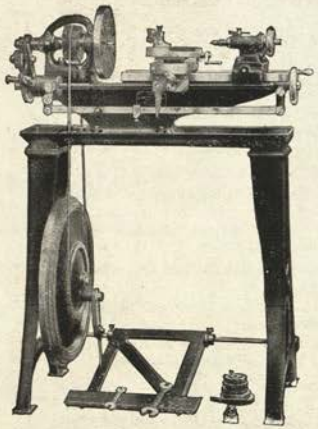

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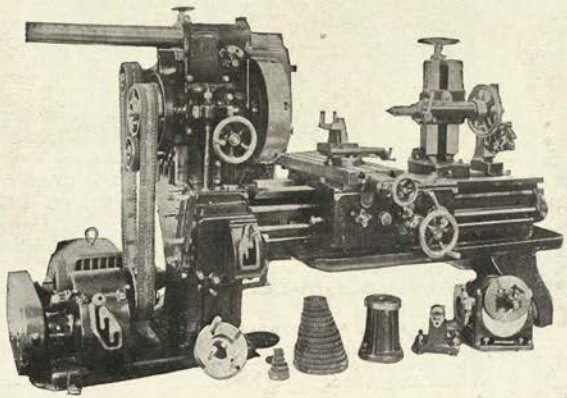

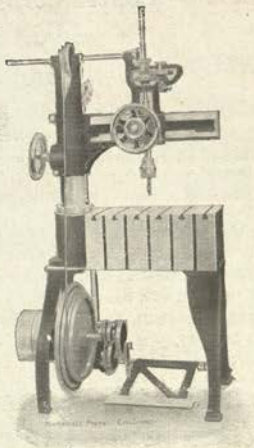

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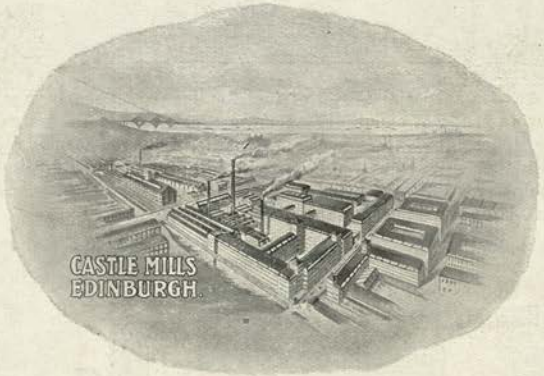

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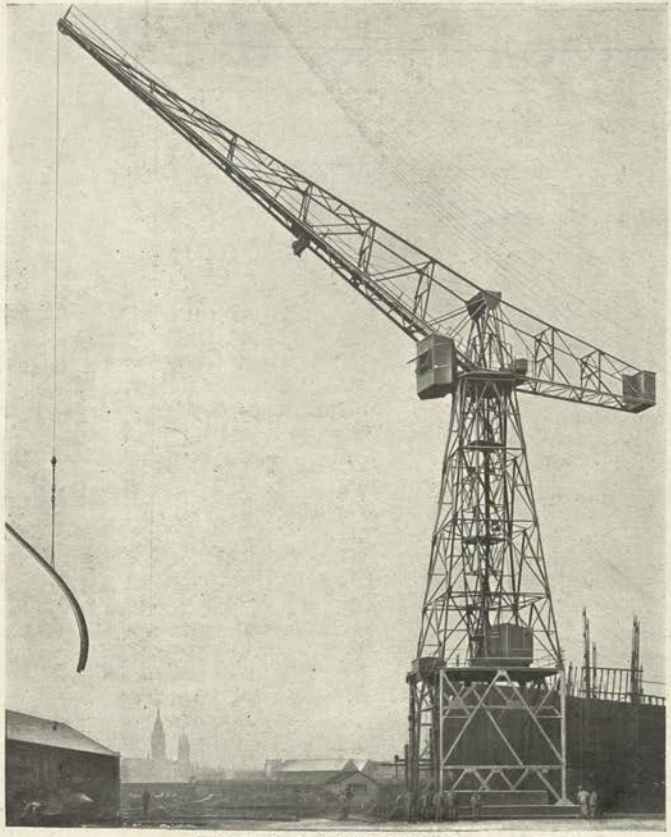

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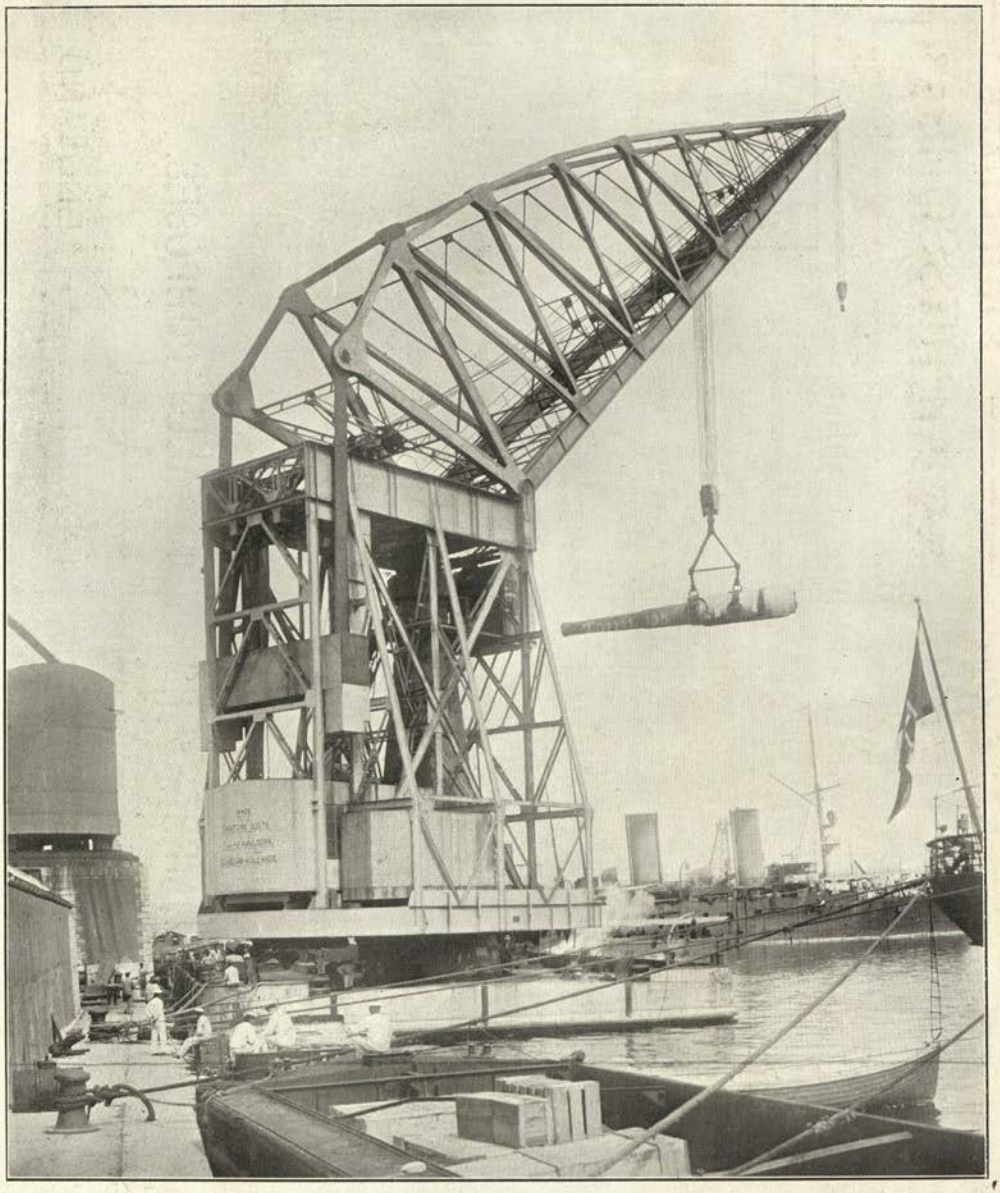

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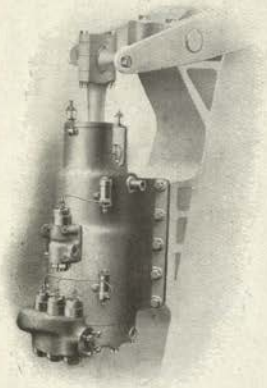
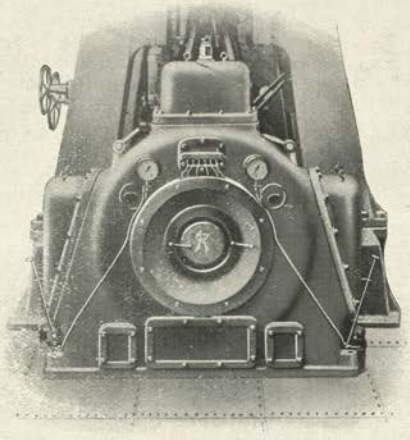


STEERING COMPRESSOR.



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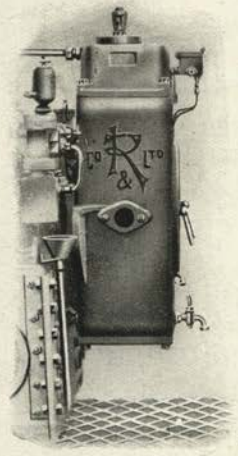

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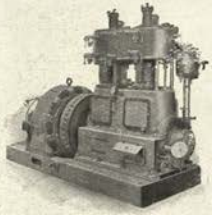

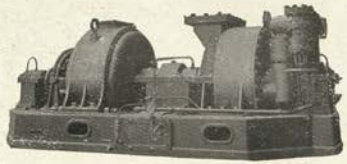

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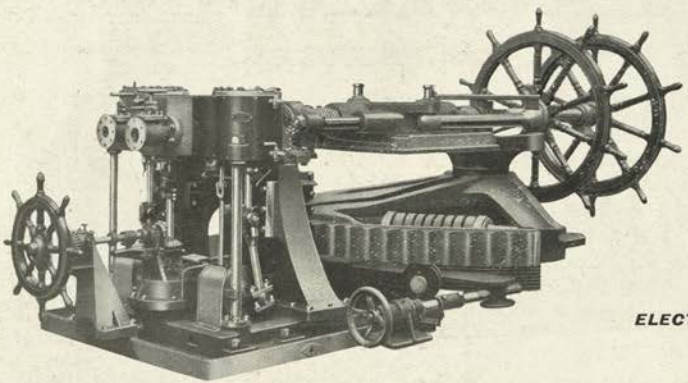

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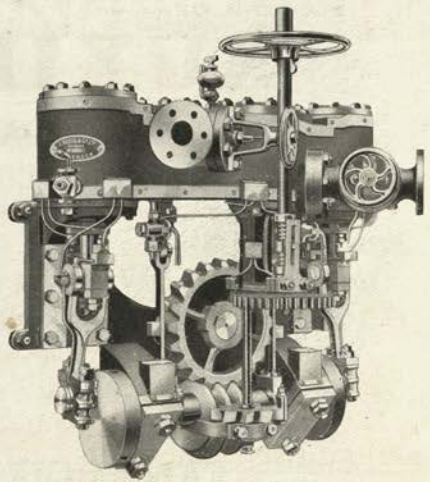

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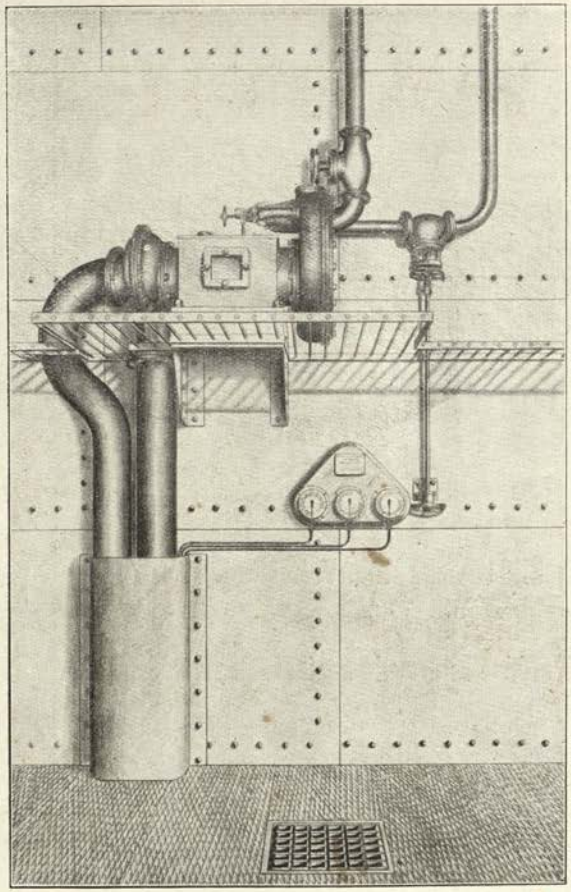

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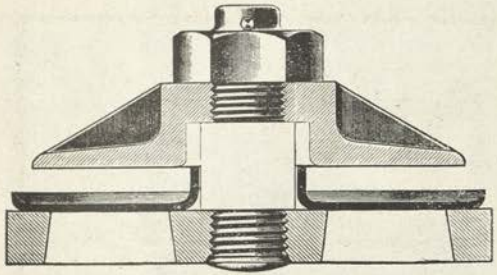

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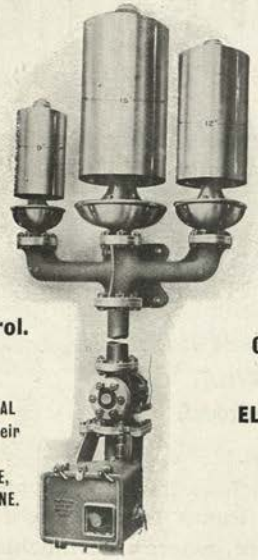

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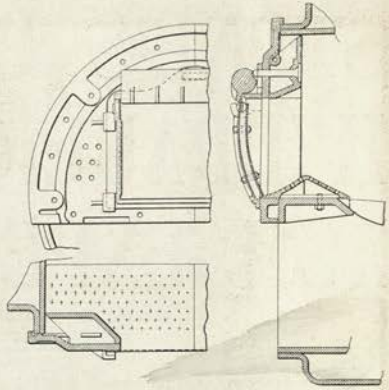

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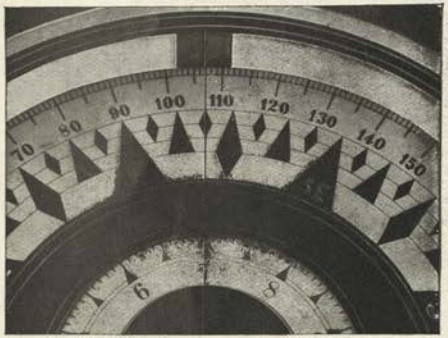

THE illustration on the left shows the arrangement of the Dials of the Receivers used for Steering. The Inner Dial makes one revolution for 10 degrees alteration of Course, so that an extremely small amount of movement can be instantly observed on the Inner Dial. The Inner Dial would move so that the Figure 6 came under the Lubber Line should the Course alter from 107, which is shown in the Figure, to 106.

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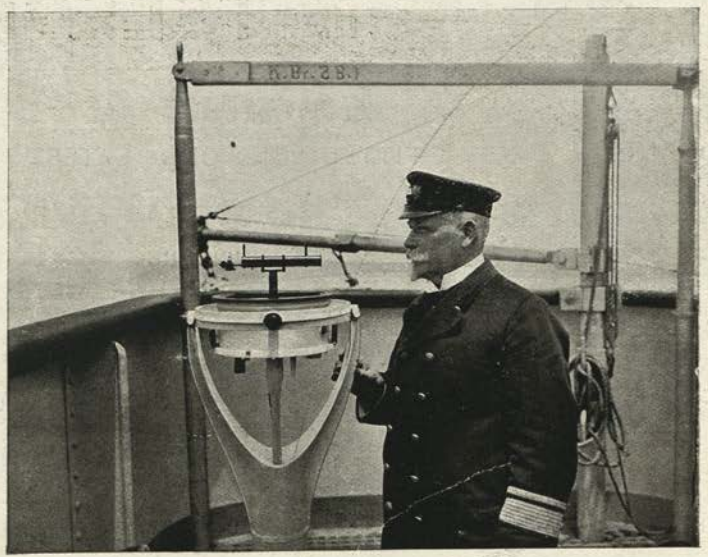

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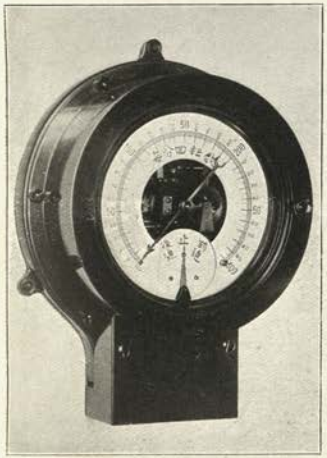

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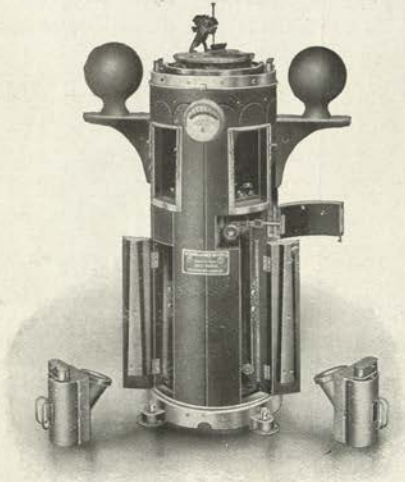

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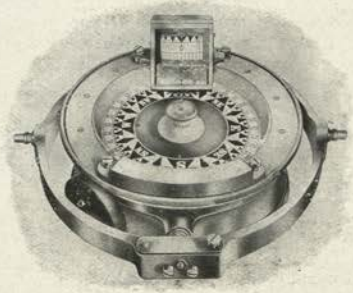
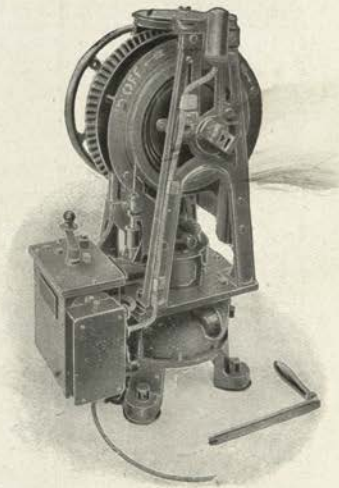


The Standard Naval Steering Compass with Course Magnifying Prism.



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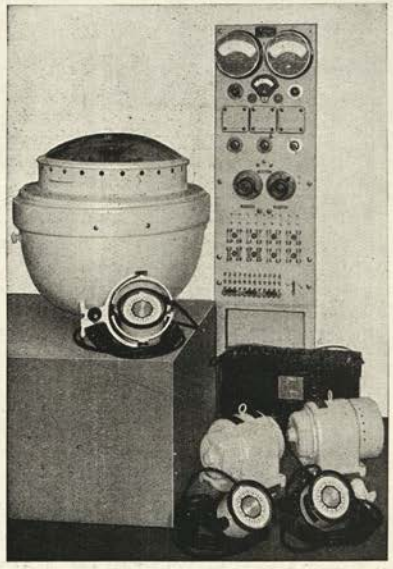

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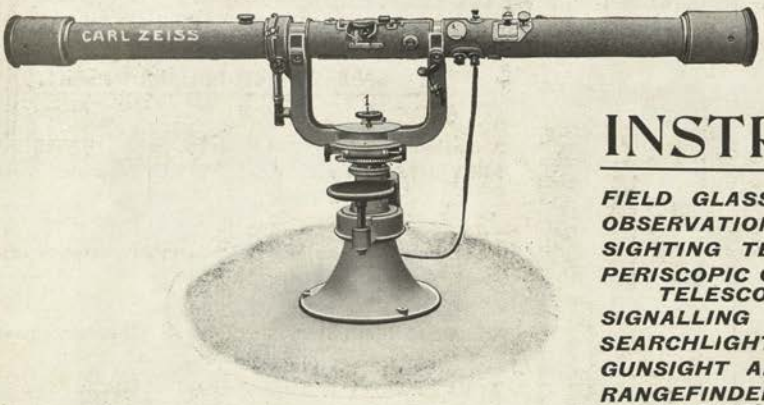

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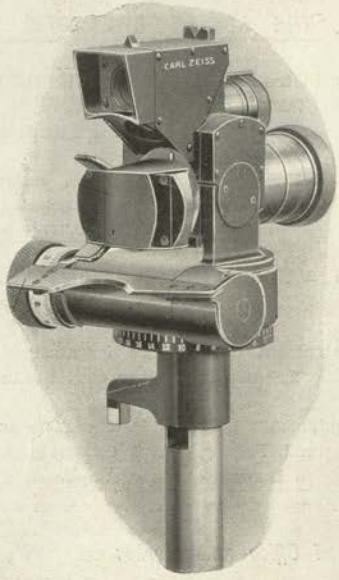

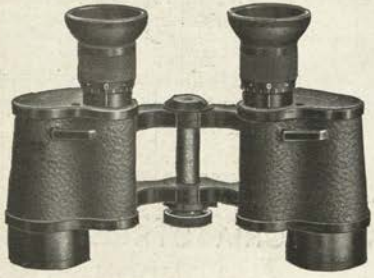

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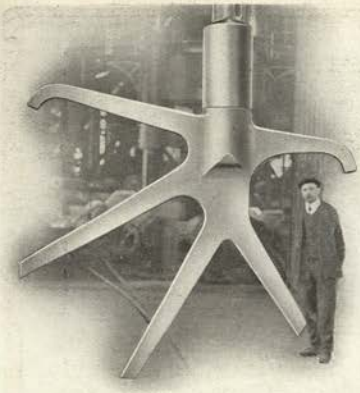

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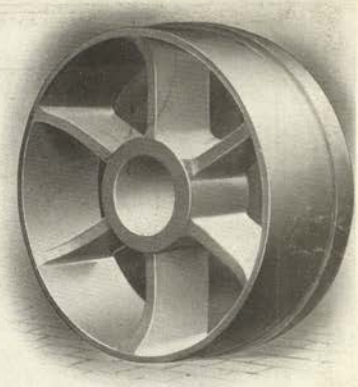

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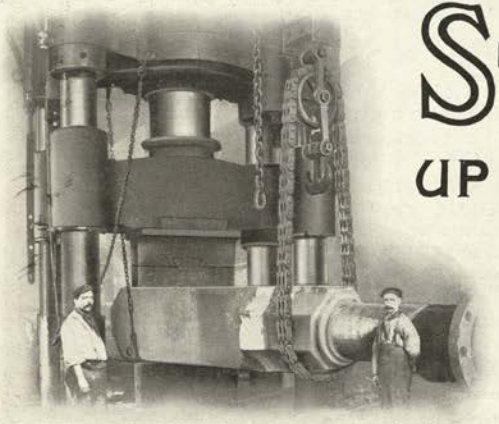

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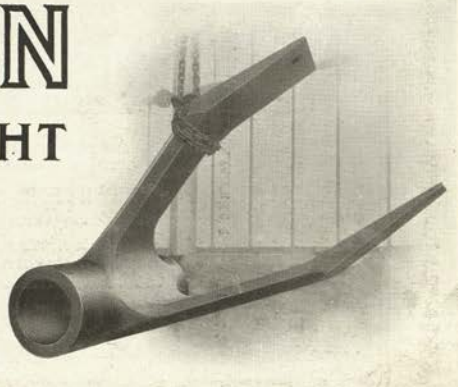

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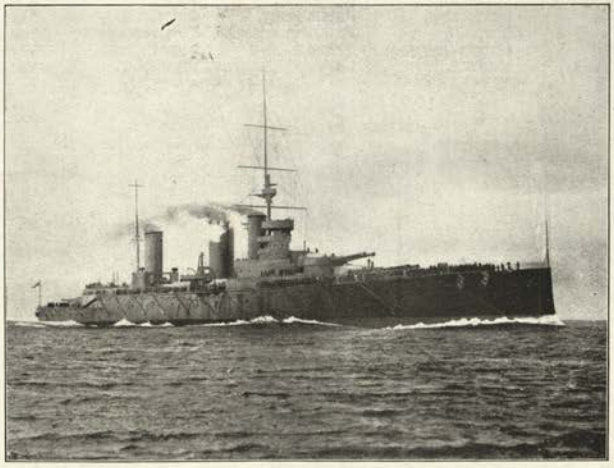

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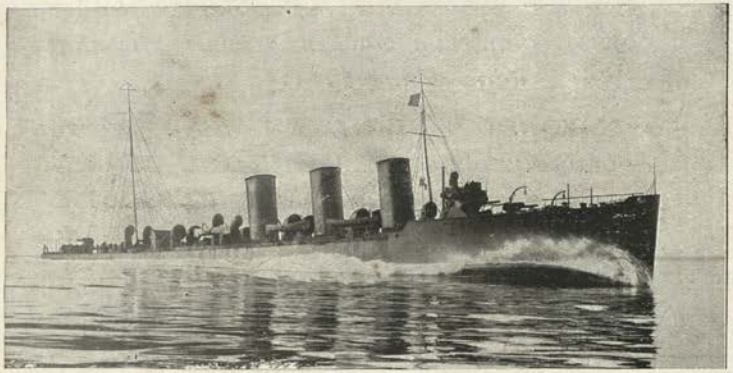

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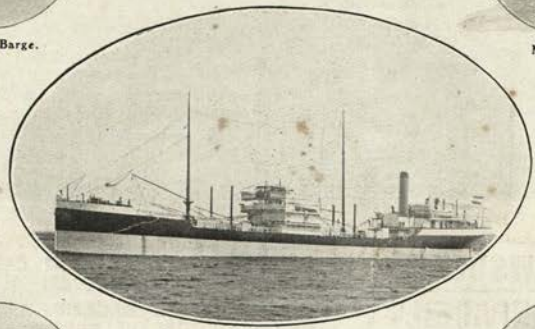

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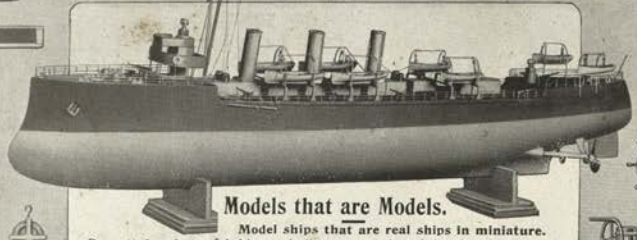

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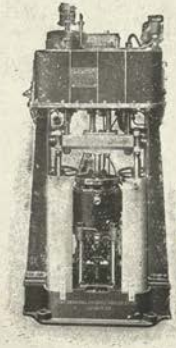

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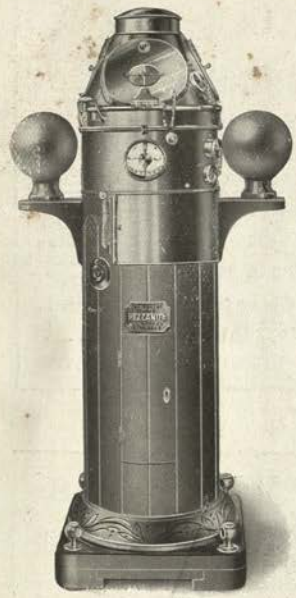

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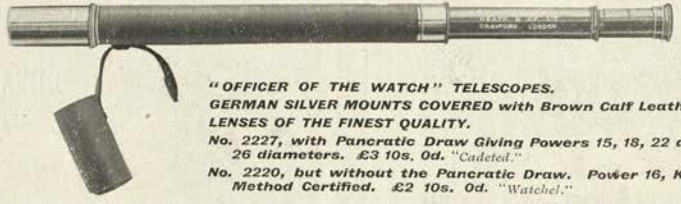

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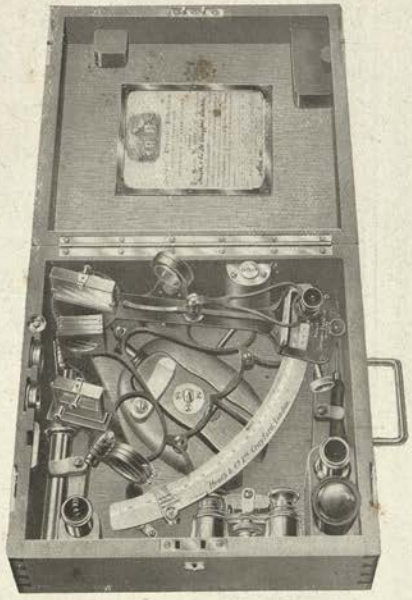

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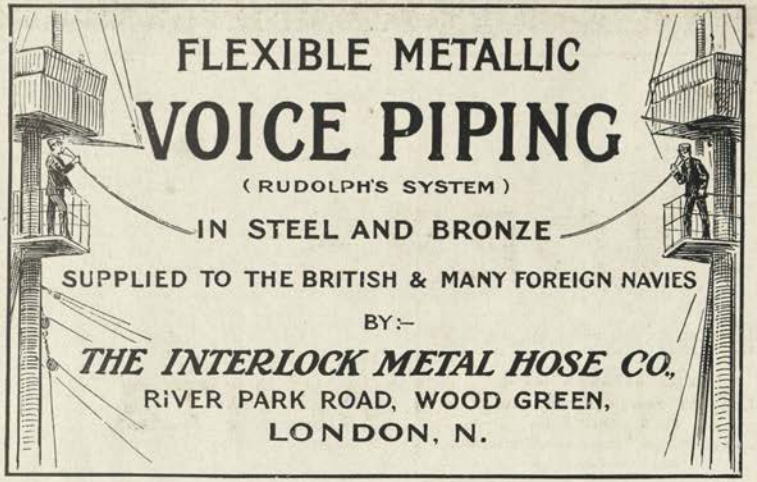

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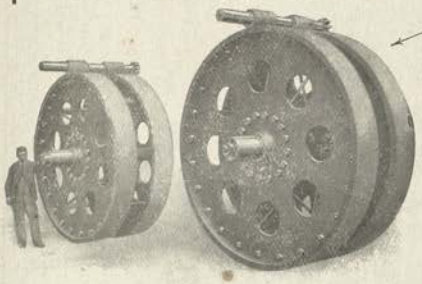

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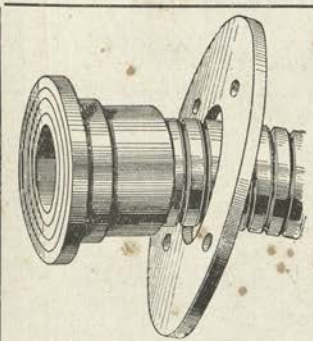

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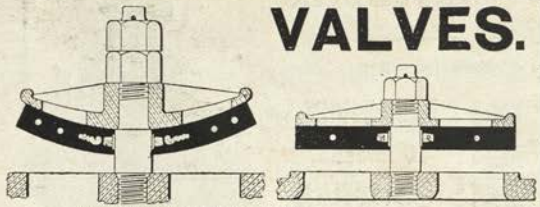

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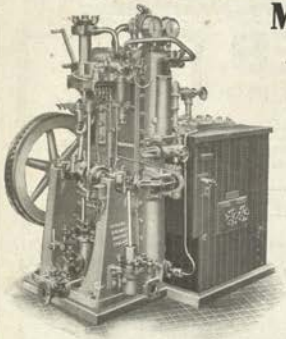

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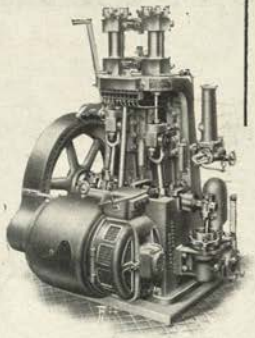

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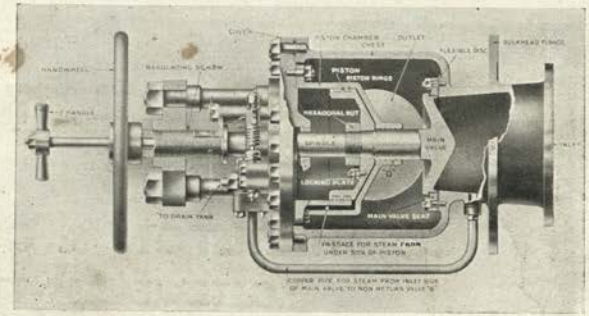

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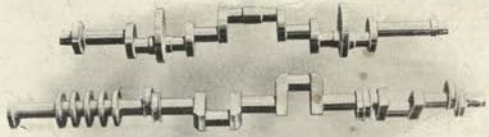

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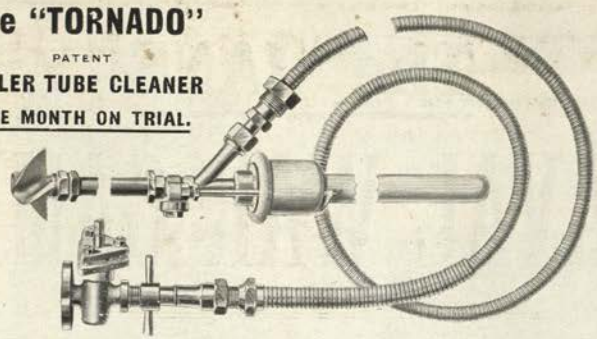

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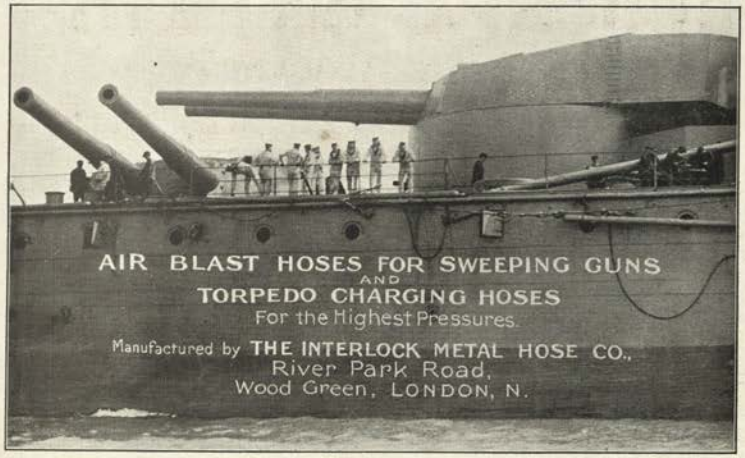
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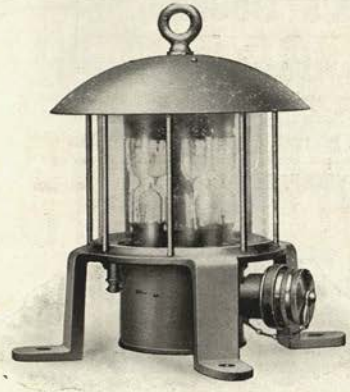

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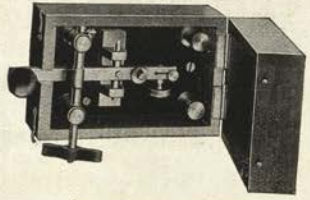

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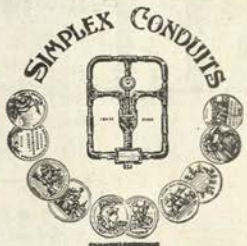

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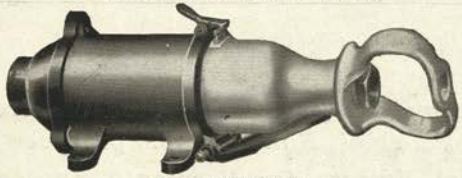

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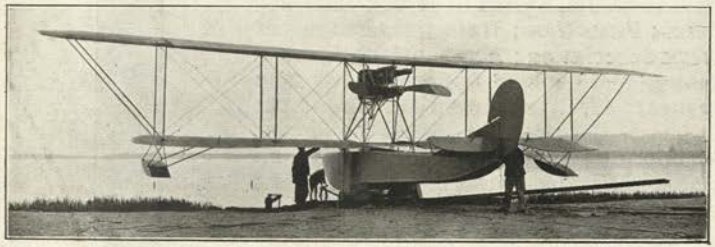

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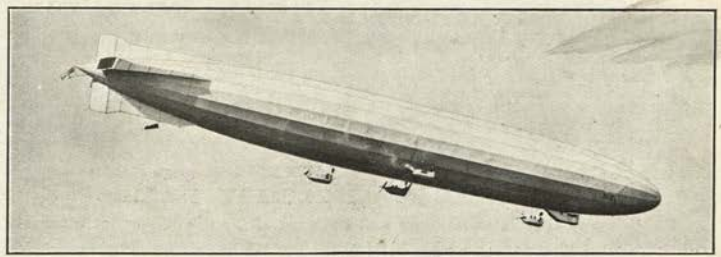

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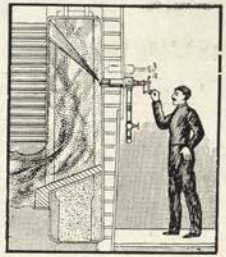

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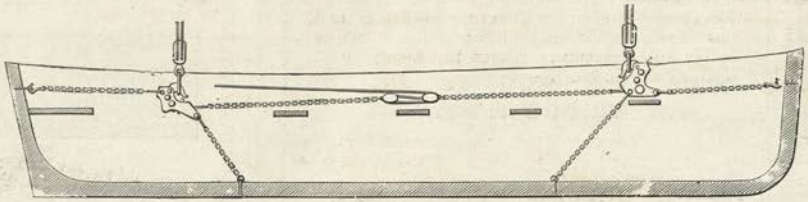

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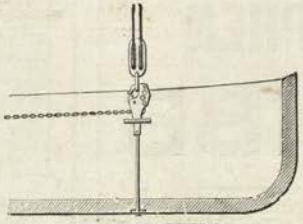

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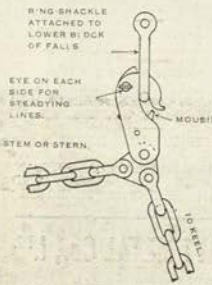

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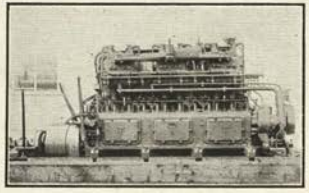

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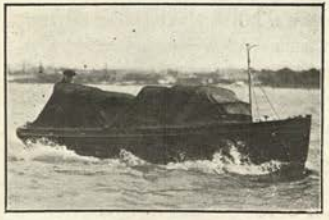

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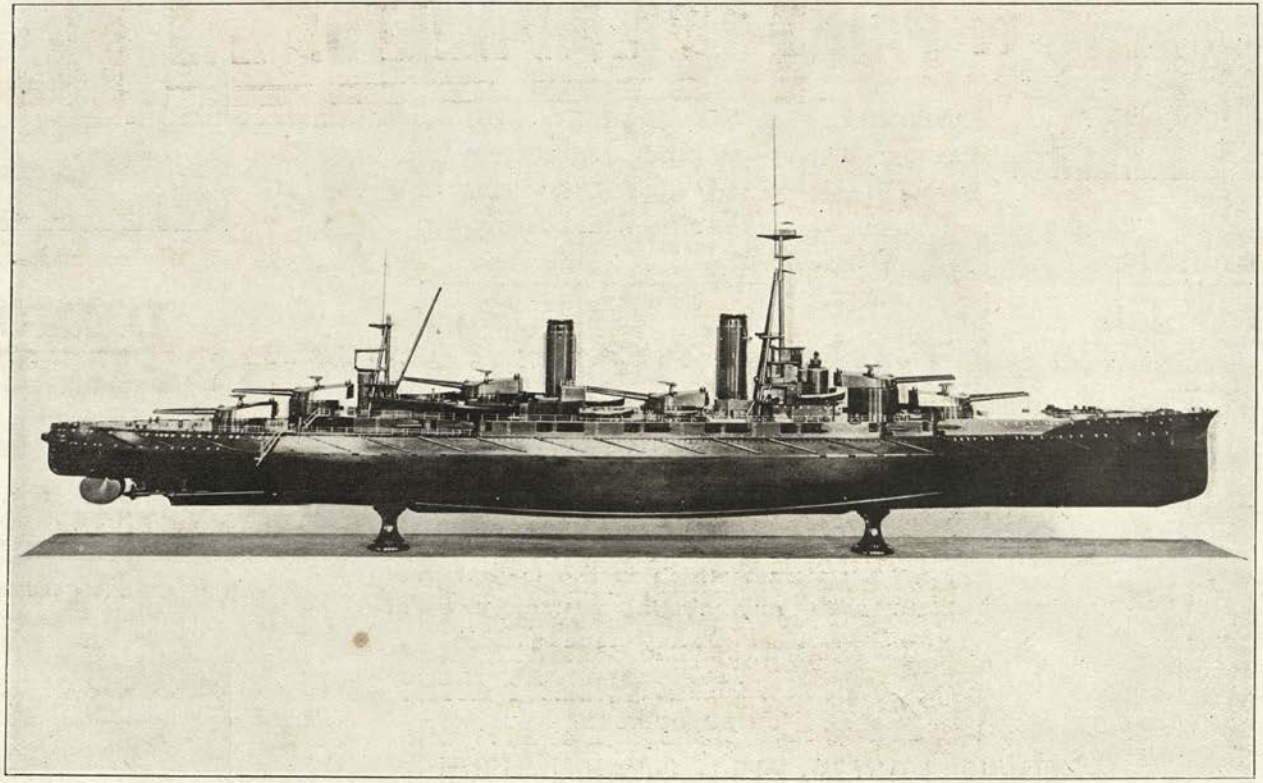

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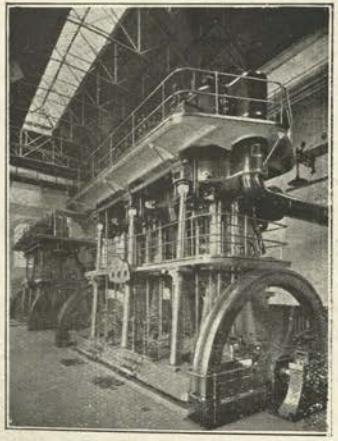

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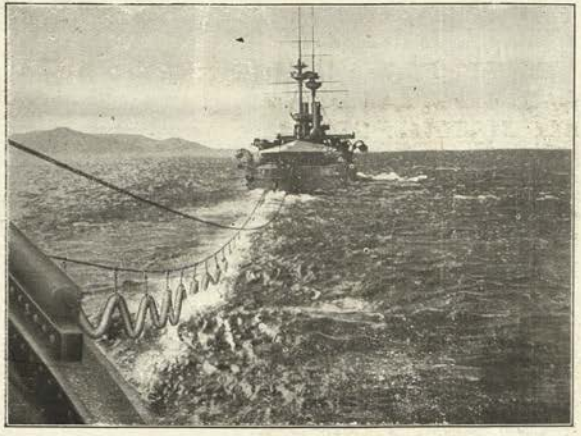
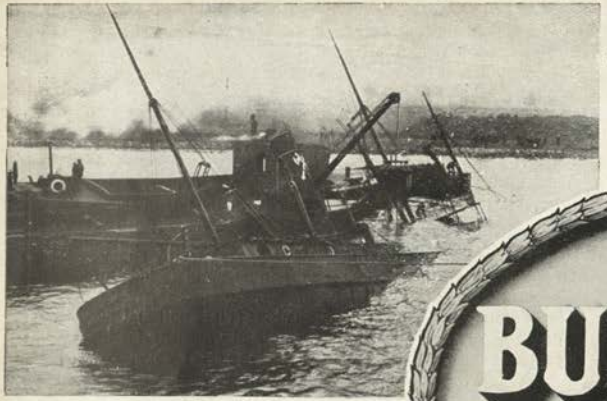


The photograph depicts H.M.S. 'Victorious,' towing an oil steamer by a hawser, along which is a flexible metallic hose through which oil can be pumped. "*Daily Mirror*" *of Feb. 17th, 1906.*



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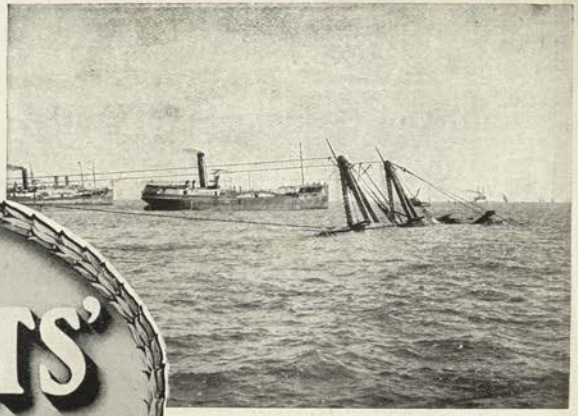

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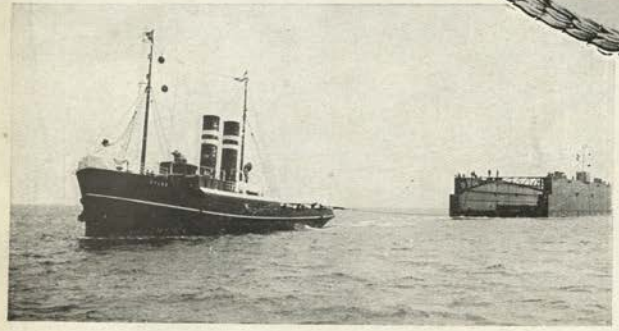

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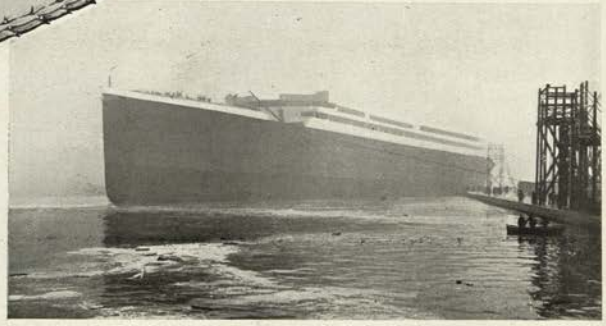

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GREEK.

Idaho has been bought from U.S.A.

ENGINEERING ARTICLE.

Pages 465, 466 and 468.—"Demologus" should be spelt "Demologos."

NORWEGIAN.

Page 375.—"*Undervandsboot*" (submarine) should be spelt "*Undervandsbоot*," and "*bäater*" should be "*booter*."

FIGHTING SHIPS.

FOUNDED AND EDITED BY

FRED T. JANE.

H1 41.

WITH A SPECIAL CHAPTER ON THE PROGRESS OF MARINE ENGINEERING, BY CHARLES DE GRAVE SELLS, M.Inst., C.E.

SAMPSON LOW, MARSTON & CO., LTD.,

LONDON, E.C.

1914.

(SEVENTEENTH YEAR OF ISSUE).

SECOND EDITION.

CORRECTED TO DATE, EXCEPT AS REGARDS THE BRITISH NAVY.

PRINTED BY NETHERWOOD, DALTON & CO., PHŒNIX WORKS, RASHCLIFFE, HUDDERSFIELD.

PREFACE.

THE principal changes in the 1914 "*Fighting Ships*" are of the "minor detail" order rather than in the direction of things showy and dramatic.

Attention may be drawn to the fact that upon comparison with past issues the identification silhouettes will be found to have undergone considerable revisions of a two-fold nature. Both are of a purely practical nature.

In the first place, an effort has been made to reduce the number of silhouettes in each navy so far as possible. In the past the custom has been to silhouette all ships which differ from each other in appearance, including ships of the same class which happen to be slightly differently rigged.

This policy is now being reversed. A case in point is found in the British "Town" class cruisers, which were served last year by three distinct silhouettes. Had the old system been continued this year, there would have been at least four, if not five, silhouettes all exactly alike in general appearance though differing in some trivial detail by no means apparent to a casual glance. Under the new system one single silhouette serves for the whole group, and the reader seeking to differentiate is referred to the pages devoted to this group—the underlying idea being that the point of real moment is to differentiate instantly between a "Town" class cruiser and, say the "Duke of Edinburgh" class. A multitude of silhouettes of "Towns," all more or less alike, altered this from a very simple task to a somewhat compound and difficult one.

This is merely an isolated example—dozens of others could be cited. The key note of any really useful identification system must be simplicity and the strict elimination of everything superfluous. Hence the simplification sought after in this issue.

This year a number of silhouettes of "Dreadnoughts" have been replaced by others drawn on lines suggested by the late Commander A. Rice, R.N. The idea is that a ship is very rarely seen exactly broadside. No matter how broadside she may look she is almost sure to be at a slight angle, and then tripod masts and funnels which are at all close together merge into one mass. Similarly, though one knows that the guns are there, they rarely show as represented in the conventional silhouette drawn from a photo, because they blur in with hatchways and people on deck, and all detail is lost in a general "mass."

This is, of course, optically correct. It is in addition exactly how an artist would proceed seeking to depict distant ships, but whether for recognition purposes it is better to indicate ships as they *look* or to draw them "as one knows they are," is a point upon which I should be very glad to have the opinions of readers who use the silhouettes at sea. I may add that for some years now it has been customary to eliminate a good deal of minor detail in "*Fighting Ships*" silhouettes—but these new system ones go, of course, a great deal further. The best test will be to compare the "Dreadnoughts" in this year's edition with those in last year's.

The second change in connection with the Identification Silhouettes is in the matter of the letters assigned for signal purposes to the various ships. These are now all re-arranged on the uniform system, first introduced last year.

Under this system:—

A B C D E F all mean *one* funnel.
G H I J K L ,, ,, *two* funnels.
N O P Q R S ,, ,, *three* funnels.
U V W X Y Z ,, ,, *four* or more funnels.

T & M being the special flags for torpedo craft and merchant ships are only used in this series when very necessary.

Capital ships are all denoted by a single letter only. Ships of less importance are given two letters, and the second letter invariably denotes the number of *masts*, just as the first denotes the number of funnels.

All such ships having any general common resemblance are denoted by the same first letter. For example, the "Challenger" and "Arrogant" classes being rather alike are both variants of the same initial (R.G. and R.H.) The underlying idea of this is that supposing a mercantile officer unfamiliar with warships endeavours to signal by the F.S. code a ship or ships sighted, it shall be instantly obvious what his probable error is if he has made a mistake.

For the rest, the principal new photographs mainly concern little-known ships, auxiliaries, etc., etc. Attention in "*Fighting Ships*" is always specially concentrated on such craft, because while photos of capital ships continually appear everywhere, "*Fighting Ships*" is the only publication in the world which gives pictures of auxiliaries and those other small craft which are never heard of unless a war is in progress. Then they generally become prominent.

Special interest attaches to this year's frontispiece—the official model of the Japanese battleship "Fuso," published by kind permiss on of the Japanese Admiralty.

In conclusion, I tender my thanks to the many correspondents from all over the world who have so kindly sent information, photographs, etc., etc. May I ask those who detect misprints, or who desire to notify changes, to let me know as soon as possible after the publication of this edition? A book of this sort takes a good three months to print and bind, so that some portions necessarily have to go to press a long time before they appear.

FRED T. JANE.

Hill House,
Bedhampton, Hants,
England.

CONTENTS.

PART I.

PAGE.

ALPHABETICAL LIST OF ADVERTISERS ... v

CLASSIFIED LIST OF ADVERTISERS ... vi

PREFACE 2

TECHNICAL TERMS IN FOREIGN LANGUAGES 10

FIGHTING SHIPS SIGNAL CODE 12

ALPHABETICAL INDEX OF BATTLESHIPS AND CRUISERS 5

ALPHABETICAL INDEX OF TORPEDO CRAFT 7

THE GREAT POWERS (in order of strength).

1ST, BRITISH 15
- Battleships 33
- Cruisers 55
- Torpedo Craft 78
- Colonial etc. Navies 100

THE GREAT POWERS *(cont.)*—

PAGE.

2ND, GERMAN 104
- Battleships 116
- Cruisers 129
- Torpedo Craft 143

3RD, UNITED STATES 150
- Battleships 164
- Cruisers 179
- Torpedo Craft 188

4TH, JAPANESE 212
- Battleships 220
- Cruisers 235
- Torpedo Craft 245

5TH, FRENCH 248
- Battleships 255
- Cruisers 265
- Torpedo Craft 280

6TH, ITALIAN 286
- Armoured Ships 292
- Protected Cruisers 305
- Torpedo Craft 308

THE GREAT POWERS *(cont.)*—

PAGE.

7TH, AUSTRO-HUNGARIAN 315
- Battleships 319
- Cruisers 323
- Torpedo Craft 328

8TH, RUSSIAN 331
- Battleships 338
- Cruisers 342
- Torpedo Craft 351
- Black Sea Fleet 354

EUROPEAN COAST DEFENCE NAVIES (geographically arranged)—

N. Europe ... SWEDISH 361
„ ... NORWEGIAN 371
„ ... DANISH 376
„ ... DUTCH 382
S. Europe ... SPANISH 390
„ ... PORTUGUESE ... 397
„ ... GREEK ... 401
„ ... TURKISH 409
„ ... BULGARIAN 419
„ ... ROUMANIAN 420

AMERICAN COAST DEFENCE NAVIES
(arranged alphabetically)

	PAGE.
ARGENTINE	422
BRAZILIAN	433
CHILIAN	440
COLOMBIAN	447
COSTA RICAN	447
CUBAN	448
ECUADOR	449
HAYTIAN	450
MEXICAN	451
NICARAGUA	452
PANAMA	452
PERUVIAN	452
URUGUAYAN	455
VENEZUELAN	456
LESSER ASIATIC NAVIES—	
CHINESE	457
SIAMESE	462
PERSIAN	463
SARAWAK	463
AFRICAN NAVIES—	
EGYPTIAN	464
LIBERIAN	464
MOROCCO	464

PART II.

	PAGE
PROGRESS OF NAVAL ENGINEERING (**C. de Grave Sells, M.Inst. C.E.**)	465

PART III.

SILHOUETTE INDEX OF MERCHANT SHIPS OF THE WORLD (**W. A. Bieber**)	496

ALPHABETICAL INDEX OF BATTLESHIPS, CRUISERS AND SCOUTS.

	PAGE
Aboukir (British)	61
Achilles (British)	56
Active (British)	68
Adamastor (Portuguese)	390
Admiral Makaroff (Russian)	343
Admiral Spaun (Austrian)	326
Adventure (British)	70
Ægir (German)	128
Africa (British)	47
Agamemnon (British)	46
Ajax (British)	35
Akashi (Japanese)	241
Aki (Japanese)	225
Akitsushima (Japanese)	243
Alabama (U.S.A.)	176
Albany (U.S.A.)	185
Albatross (German)	141
Albemarle (British)	50
Albion (British)	53
Alexander III (Russian)	354
Alfonso XIII (Spanish)	392
Almirante Brown (Argentine)	427
Almirante Cochrane (Chilian)	440
Almirante Cochrane (old) (Chilian)	446
Almirante Grau (Peru.)	453
Almirante Latorre (Chilian)	440
Almirante Reis (Portuguese)	398
Amalfi (Italian)	297
Amazone (German)	139
Amethyst (British)	73
Amiral Aube (French)	269
Ammiraglio di St. Bon (Italian)	301
Amphion (British)	68
Amphitrite (British)	62
Andrea Doria (Italian)	295
Andrei Pervoswanni (Russian)	340
Antrim (British)	58
Aran (Swedish)	362
Arcona (German)	138
Arethusa (British)	64
Argonaut (British)	62
Argyll (British)	58
Ariadne (British)	62
Arkansas (U.S.A.)	167
Arpad (Austrian)	322
Asahi (Japanese)	231
Asama (Japanese)	238
Askold (Russian)	346
Aso (Japanese)	236
Aspern (Austrian)	326
Assari-Tewfik (Turkish)	450
Astrea (British)	75
Attentive (British)	70
Audacious (British)	35
Augsburg (German)	135
Aurora (Russian)	346
Aurora (British)	64
Australia (British)	100
Averoff (Greek)	403
Azuma (Japanese)	237
Babenberg (Austrian)	322
Bacchante (British)	61
Bahia (Brazil)	436
Barrozo (Brazilian)	437
Bayan (Russian)	343
Bearn (French)	255
Belgrano (Argentine)	425
Bellerophon (British)	40
Bellona (British)	69
Benbow (British)	33
Benedetto Brin (Italian)	299
Benjamin Constant (Brazilian)	437
Beowulf (German)	128
Berlin (German)	138
Berwick (British)	59
Birmingham (British)	65
Birmingham (U.S.A.)	184
Bjoergoin (Norwegian)	372
Black Prince (British)	57
Blanche (British)	68
Blanco Encalada (Chilian)	444
Blonde (British)	68
Blücher (German)	129
Boadicea (British)	69
Bogatyr (Russian)	346
Borodino (Russian)	338
Bootakof (Russian)	345
Bouvet (French)	263
Brandenburg (German)	128
Braunschweig (German)	125
Bremen (German)	138
Breslau (German)	135
Bretagne (French)	256
Bristol (British)	67
Britannia (British)	47
Brooklyn (U.S.A.)	182
Budapest (Austrian)	322
Buenos Aires (Argentine)	428
Bulwark (British)	51
Cæsar (British)	54
Caio Duilio (Italian)	293
Calabria (Italian)	305
California (U.S.A.)	180
Calliope, (British)	64
Cambrian (British)	78
Canopus (British)	53
Capitan Prat (Chilian)	442
Carlo Alberto (Italian)	302
Carysfort (British)	64
Carnarvon (British)	58
Carnot (French)	264
Catunda (Spanish)	393
Caroline (British)	64
Centurion (British)	35
Chacabuco (Chilian)	443
Challenger (British)	72
Champion (British)	64
Chao Ho (Chinese)	458
Charlemagne (French)	262
Charles Martel (French)	264
Charleston (U.S.A.)	180
Charybdis (British)	75
Chatham (British)	66
Chattanooga (U.S.A.)	185
Chester (U.S.A.)	184
Cheyenne (U.S.A.)	178
Chikuma (Japanese)	239
Chitose (Japanese)	241
Chiyoda (Japanese)	238
Cincinnati (U.S.A.)	186
Cleopatra (British)	64
Cleveland (U.S.A.)	185
Cochrane (British)	56
Comus (British)	64
Collingwood (British)	39
Cöln (German)	142
Colorado (U.S.A.)	180
Colossus (British)	37
Columbia (U.S.A.)	190
Commandante Aquirre (Peruvian)	453
Commonwealth (British)	47
Condé (French)	266
Condorcet (French)	258
Connecticut (U.S.A.)	173
Conqueror (British)	36
Conquest (British)	64
Conti di Cavour (Italian)	294
Cordelia (British)	64
Cornwall (British)	59
Cornwallis (British)	50
Coronel Bolognesi (Peru)	453
Courbet (French)	257
Crescent (British)	63
Cressy (British)	61
Cumberland (British)	59
Dandolo (Italian)	295
Dante Alighieri (Italian)	295
Danton (French)	258
Danzig (German)	137
Dartmouth (British)	66
Defence (British)	55
Delaware (U.S.A.)	175
Democratie (French)	259
D'Entrecasteaux (French)	273
De Julio (Argentine)	428
Delaware (U.S.A.)	169
Denver (U.S.A.)	185
Deodoro (Brazilian)	486
De Ruyter (Dutch)	393
Desaix (French)	270
Descartes (French)	274
De Malo (Argentine)	429
Des Moines (U.S.A.)	185
D'Estrées (French)	272
Derflinger (German)	121
De Ruyter (Dutch)	385
Deutschland (German)	125
Devonshire (British)	58
Diadem (British)	62
Diamond (British)	75
Diana (British)	74
Diana (Russian)	346
Diderot (French)	258
Dido (British)	74
Dominion (British)	47
Donegal (British)	59
Doris (British)	74
Drake (British)	60
Dreadnought (British)	41
Dresden (German)	136
Dristigheten (Swedish)	363
Dryad (British)	76
Dublin (British)	66
Du Chayla (French)	274
Duilio (Italian)	300
Duke of Edinburgh (British)	57
Duncan (British)	50
Dupetit Thouars (French)	270
Dupleix (French)	270
Eclipse (British)	74
Edgar (British)	63
Edgar Quinet (French)	265
Eidsvold (Norwegian)	373
Ekaterina II (Russian)	351
Elba (Italian)	305
Elizabetha (Roumanian)	120
Elsass (German)	125
Emanuele Filiberto (Italian)	301
Emden (German)	136
Emperador Carlos V. (Spanish)	394
Emperor of India	34
Encounter (British)	100
Endymion (British)	63
E. Renan (French)	267
Erz. Ferdinand Max (Austrian)	321
Erz. Franz Ferdinand (Austrian)	320
Erzherzog Friedrich (Austrian)	321
E. Gazelle (German)	134
Ersatz. Gefion (German)	321
Erzherzog Karl (Austrian)	134
Ersatz. Brandenburg (German)	121
Ersatz. Hela (German)	134
Ersatz. Hertha (German)	121
Ersatz. K. Augusta (German)	125
Ersatz K. Friedrich III (German)	116
Ersatz. K. F. Wilhelm (German)	121
Ersatz. P. Wilhelm (German)	141
Ersatz. Weissenberg (German)	121
Ersatz. Worth (German)	116
Ersatz. Seeadler (German)	162
Esmeralda (Chilian)	443
Espana (Spanish)	392
Essex (British)	59
Estremadura (Spanish)	394
Etna (Italian)	306
Etruria (Italian)	306
Europa (British)	62
Euryalus (British)	61
Evertsen (Dutch)	386
Exmouth (British)	50
Falmouth (British)	66
Fearless (British)	68
Fethi-i-Bulend (Turkish)	449
Flanders (French)	255
Floriano (Brazilian)	426
Florida (U.S.A.)	168
Foresight (British)	70
Formidable (British)	52
Forte (British)	75
Forward (British)	70
Fox (British)	75
France (French)	257
Francesco Ferruccio (Italian)	300
Frauenlob (German)	138
Freya (German)	133
Friant (French)	274
Frederich der Grosse (German)	118
Friedrich Karl (German)	132
Friesland (Dutch)	394
Frithjof (German)	128
Fuji (Japanese)	233
Fürst Bismarck (German)	133
Fuso (Japanese)	229
Fylgia (Swedish)	365
Galatea (British)	64
Galveston (U.S.A.)	185
Gangzoot (Russian)	329
Garibaldi (Argentine)	426
Garibaldi (Italian)	306
Gaulois (French)	262
Gazelle (German)	139
Gefion (German)	140
Geiser (Danish)	379
Gelderland (Dutch)	386
General Belgrano (Argentine)	425
Geo. Pobiedonosets (Russian)	357
Georgia (U.S.A.)	174
Gibraltar (British)	63
Giovanni Bausan (Italian)	306
Giulio Cesare (Italian)	294
Giuseppe Garibaldi (Italian)	300
Glasgow (British)	67
Gloire (French)	269
Glory (British)	53
Gloucester (British)	67
Gneisenau (German)	130
Goeben (German)	123
Goliath (British)	53
Good Hope (British)	60
Göta (Swedish)	364
Grafton (British)	63
Grieg (Russian)	345
Gromoboi (Russian)	344
Grosser Kurfürst (German)	117
Gueydon (French)	270
Guilio Cesare (Italian)	294
Guichen (French)	273
Habsburg (Austrian)	322
Hagen (German)	128
Hai Chen } (Chinese)	459
Hai Chi }	459
Hai Chu }	459
Hai Yung (Chinese)	459
Hairredin Barbarrosse (Turkish)	413
Hamburg (German)	138
Hamidieh (Turkish)	415
Hampshire (British)	58
Hannibal (British)	54
Hannover (German)	124
Hansa (German)	133
Harald Haarfarge (Norwegian)	373
Haruna (Japanese)	221
Hashidate (Japanese)	243
Hawke (British)	63
Heimdal (Danish)	379
Heimdall (German)	128
Heemskerck (Dutch)	384
Hela (German)	140
Helle (Greek)	405
Helgoland (Austrian)	325
Helgoland (German)	119
Henri IV. (French)	262
Hercules (British)	37
Herluf Trolle (Danish)	377
Hermes (British)	72
Hermione (British)	75
Hertha (German)	133
Hertog Hendrik (Dutch)	385
Hessen (German)	126
Hibernia (British)	47
Highflyer (British)	72
Hildebrand (German)	128
Hindustan (British)	47
Hirato (Japanese)	229
Hizen (Japanese)	230
Hi-Yei (Japanese)	221
Hogue (British	61
Holland (Dutch)	386
Hood (British)	74
Hyacinth (British)	72
Hydra (Greek)	404
Ibuki (Japanese)	225
Idaho (U.S.A.)	172
Idzumi (Japanese)	236
Ievstafi (Russian)	355
Iki (Japanese)	234
Ikoma (Japanese)	226
Illinois (U.S.A.)	176
Illustrious (British)	54
Imperator Alexr. II. (Russian)	347
Imperator Pavel (Russian)	340
Imperatiza Maria (Russian)	354
Implacable (British)	52
Inconstant (British)	64
Indefatigable (British)	44
Independencia (Argentine)	427
Indiana (U.S.A.)	177
Indomitable (British)	45
Inflexible (British)	45
Invincible (British)	45
Ioann Zlatoust (Russian)	355
Iowa (U.S.A.)	177
Iron Duke (British)	34
Irresistible (British)	52
Isis (British)	74
Ismail (Russian)	338
Italia (Italian)	303
Ivan Zlatoust (Russian)	378
Iver Hvitfeldt (Danish)	378
Itsukushima (Japanese)	243
Iwami (Japanese)	228
Iwate (Japanese)	236
J. van Heemskerck (Dutch)	384
Jauréguiberry (French)	264
Jean Bart (French)	257
Jeanne d'Arc (French)	271
Jemtchug (Russian)	346
John Ericsson (Swedish)	365
Jules Ferry (French)	268
Jules Michelet (French)	266
Juno (British)	74
Jupiter (British)	54
Jurien de la Gravière (French)	272
Justice (French)	259
Kagoul (Russian)	357
Kaiser (German)	118
Kaiser Barbarossa (German)	132
Kaiser Franz Josef (Austrian)	324
Kaiser Friedrich III. (German)	127

ALPHABETICAL INDEX OF BATTLESHIPS, CRUISERS AND SCOUTS.

	PAGE
Kaiserin (German)	118
Kaiser Friedrich III (German)	127
Kaiser Karl VI. (Austrian)	323
Kaiser Karl der Grosse (German)	127
Kaiser Wilhelm II. (German)	127
K. Barbarossa (German)	127
K. Wilhelm der Grosse (German)	127
Kaiserin Augusta (German)	134
Kaiserin Augusta (German)	162
Kaiserin Elisabeth (Austrian)	324
K. u K. Maria Theresia (Austrian)	324
Kansas (U.S.A.)	177
Karlsrühe (German)	134
Kasagi (Japanese)	257
Kashima (Japanese)	227
Kasuga (Japanese)	235
Katori (Japanese)	227
Kawachi (Japanese)	222
Kearsarge (U.S.A.)	176
Kent (British)	59
Kentucky (U.S.A.)	176
Kinbwin (Russian)	338
King Alfred (British)	60
King Edward (British)	47
King George V. (British)	34
Kirischima (Japanese)	221
Klèber (French)	270
Koenig (German)	117
Kolberg (German)	135
Köln (German)	135
K. Regentes (Dutch)	123
Kongo (Japanese)	221
Konig Albert (German)	118
Konigsberg (German)	137
Koningin Regentes (Dutch)	385
Kortenaar (Dutch)	386
Kurama (Japanese)	225
Lancaster (British)	59
Languedoc (French)	255
Latouche Tréville (French)	274
Lavoisier (French)	274
Leipzig (German)	131
Léon Gambetta (French)	268
Leonardo da Vinci (Italian)	294
Lepanto (Italian)	303
Leviathan (British)	60
Libertad (Argentine)	427
Libia (Italian)	305
Liguria (Italian)	306
Lion (British)	43
Liverpool (British)	67
Lombardia (Italian)	306
London (British)	51
Lord Nelson (British)	46
Lorraine (French)	256
Lothringen (German)	126
Louisiana (U.S.A.)	173
Lowestoft (British)	65
Lübeck (German)	138
Lützow (German)	121
Magdeburg (German)	135
Maha Chakrkai (Siamese)	462
Magnificent (British)	51
Mainz (German)	135
Maine (U.S.A.)	175
Majestic (British)	54
Malaya (British)	37
Manligheten (Swedish)	362
Marco Polo (Italian)	302
Markgraf (German)	117
Marlborough (British)	34
Marsala (French)	304
Mars (British)	54
Marseillaise (French)	269
Martin van Tromp (Dutch)	
Maryland (U.S.A.)	180
Massachusetts (U.S.A.)	177
Massena (French)	263
Meeklenburg (German)	127
Medjidieh (Turkish)	415
Medusa (German)	139
Melbourne (British)	100
Melpomene (British)	75
Messudiyeh (Turkish)	413
Michelet (French)	266
Michigan (U.S.A.)	170
Mikasa (Japanese)	229
Milwaukee (U.S.A.)	181
Minas Geraes (Brazilian)	435
Minerva (British)	74
Ministro Zenteno (Chilian)	444
Minneapolis (U.S.A.)	183
Minnesota (U.S.A.)	171
Minoshima (Japanese)	234
Minotaur (British)	55
Mirabeau (French)	259
Mishima (Japanese)	234
Mississipi (U.S.A.)	173
Missouri (U.S.A.)	175
Mogami (Japanese)	244
Moltke (German)	123
Monadnock U.S.A.)	178
Monarch (British)	56
Monarch (Austrian)	322
Monmouth (British)	59
Montana (U.S.A.)	179
Montcalm (French)	270
Monterey (U.S.A.)	178
Mooravier Amursky (Russian)	345
Moreno (Argentine)	424
München (German)	138
Muin-i-Zaffer (Turkish)	414
Napoli (Italian)	298
Nassau (German)	120
Natal (British)	56
Navarin (Russian)	338
Nantilus (German)	141
Nebraska (U.S.A.)	174
Neptune (British)	38
Nevada (U.S.)	165
Nevelskoy (Russian)	345
Newcastle (British)	67
New Hampshire (U.S.A.)	171
New Jersey (U.S.A.)	174
New Orleans (U.S.A.)	185
New York (U.S.A.)	166
New Zealand (British)	44
Nidoros (Norwegian)	372
Nino Bixio (French)	304
Niitaka (Japanese)	240
Niels Juel (Danish)	377
Niobe (German)	139
Nlord (Swedish)	363
Nisshin (Japanese)	235
Noordbrabant (Dutch)	386
Norge (Norwegian)	373
Normandie (French)	255
North Carolina (U.S.A.)	179
North Dakota (U.S.A.)	169
Nottinghamn (British)	65
Novaro (Austrian)	325
Nürnberg (German)	136
Nymphe (German)	139
Ocean (British)	53
Oden (Swedish)	361
Odin (German)	128
O'Higgins (Chilian)	442
Ohio (U.S.A.)	115
Okinoshima (Japanese)	234
Oklahama (U.S.)	164
Oldenburg (German)	119
Oleg (Russian)	346
Olfert Fischer (Danish)	377
Olympia (U.S.A.)	183
Oregon (U.S.A.)	177
Orion (British)	36
Oskar II (Swedish)	362
Ostfriesland (German)	119
Otowa (Japanese)	240
Ozark (U.S.A.)	178
Pallada (Russian)	343
Pamiat Merkouria (Russian)	357
Pandora (British)	75
Pantelimon (Russian)	355
Paris (French)	257
Patagonia (Argentine)	429
Pathfinder (British)	71
Patrie (France)	260
Patrol (British)	71
Peder Skram (Danish)	377
P. Eugen (Austrian)	319
Pegasus (British)	73
Pelayo (Spanish)	393
Penelope (British)	64
Pennsylvania (U.S.A.)	164
Pelorus (British)	73
Perseus (British)	73
Petropavlovsk (Russian)	339
Petr. Veliky (Russian)	347
Phaeton (British)	64
Philomel (British)	75
Piemonte (Italian)	306
Piet Hein (Dutch)	386
Pioneer (British)	73
Pisa (Italian)	297
Pittsburg (U.S.A.)	180
Poltava (Russian)	339
Pommern (German)	124
Posen (German)	120
Pothuau (French)	271
Presidente Errazuriz (Chilian)	444
Presidente Sarmiento (Argentine)	430
Preussen (German)	126
Prince George (British)	54
Prince of Wales (British)	49
Princess Royal (British)	43
Prinz Adalbert (German)	132
Prinz Heinrich (German)	132
Prinzregent Luitpold (German)	118
Princesa de Asturias (Spanish)	395
Prometheus (British)	73
Proserpine (British)	73
Provence (French)	256
Psara (Greek)	404
Psyche (British)	73
Puerto Rico (Spanish)	
Pueyrredon (Argentine)	425
Puglia (Italian)	305
Pyramus (British)	73
Queen Elizabeth (British)	33
Queen Mary (British)	43
Quarto (Italian)	304
Queen (British)	49
Radetsky (Austrian)	320
Raleigh (U.S.A.)	186
Rechad V (Turkish)	410
Re Umberto (Italian)	303
Regentsburg (German)	134
Regina Elena (Italian)	298
Regina Margherita (Italian)	299
Reina Regente (Spanish)	394
Renan (French)	
Republica (Brazilian)	438
Republique (French)	260
Requin (French)	295
Rheinland (German)	121
Rhode Island (U.S.A.)	174
Rio de la Plata (Spanish)	394
Rio Grande do Sul (Brazilian)	436
Rividavia (Argentine)	424
Roma (Italian)	298
Roon (German)	130
Rossiya (Russian)	344
Rostislav (Russian)	356
Rostock (German)	134
Roxburgh (British)	58
Royal Arthur (British)	63
Royalist (British)	64
Rurik (Russian)	342
Russell (British)	50
Sagami (Japanese)	232
Salda (Austrian)	325
Salamis (Greek)	402
St. Louis (French)	262
St. Louis (U.S.A.)	181
St. Vincent (British)	39
Salem (U.S.A.)	184
San Giorgio (Italian)	296
Sankt Georg (Austrian)	323
San Martin (Argentine)	426
San Marco (Italian)	296
Sao Gabriel (Portuguese)	398
Sao Paulo (Brazilian)	435
Sao Rafael (Portuguese)	
Sapphire (British)	73
Sappho (British)	75
Saratoga (U.S.)	182
Sardegna (Italian)	303
Sarmiento (Argentine)	
Satsuma (Japanese)	224
Scharnhorst (German)	130
Schlesien (German)	124
Schleswig-Holstein (German)	124
Schwaben (German)	127
Scylla (British)	77
Sentinel (British)	71
Setsu (Japanese)	222
Sevastopol (Russian)	339
Seydlitz (German)	122
Shannon (British)	55
Shikishima (Japanese)	221
Shikuma (Japanese)	239
Sicilia (Italian)	303
Siegfried (German)	128
Sinop (Russian)	
Sirius (British)	75
Skirmisher (British)	71
Skjöld (Danish)	378
Slava (Russian)	341
Southampton (British)	66
South Carolina (U.S.A.)	170
South Dakota (U.S.A.)	180
Soya (Japanese)	242
Spartiate (British)	62
Spetsai (Greek)	401
Spiridof (Russian)	345
Stettin (German)	136
Stralsund (German)	135
Strassburg (German)	135
Stutgart (German)	136
Suffolk (British)	59
Suffren (French)	261
Sultan Osman I (Turkish)	412
Suma (Japanese)	243
Superb (British)	40
Sultan Mehmet Rechad V (Turkish)	411
Sutlej (British)	61
Sutsuya (Japanese)	263
Suwo (Japanese)	232
Svea (Swedish)	364
Svent Istfan (Austrian)	319
Sverige (Swedish)	361
Swiftsure (British)	48
Swietlana (Russian)	345
Sydney (British)	100
Szigetvar (Austrian)	326
Tacoma (U.S.A.)	185
Takachiho (Japanese)	243
Talahassee (U.S.A.)	178
Talbot (British)	74
Tango (Japanese)	234
Tapperheten (Swedish)	362
Tegethoff (Austrian)	319
Téméraire (British)	40
Tennessee (U.S.A.)	179
Terrible (British)	63
Texas (U.S.A.)	166
Theseus (British)	63
Thetis (German)	139
Thor (Swedish)	363
Thardon (Swedish)	355
Thule (Swedish)	364
Thunderer (British)	36
Thuringen (German)	119
Tiger (British)	42
Tirfing (Swedish)	365
Tokiwa (Japanese)	238
Tone (Japanese)	239
Tonopah (U.S.A.)	178
Topaze (British)	73
Tordenskjold (Norwegian)	373
Torgud Reis (Turkish)	415
Tri-Svititelia (Russian)	356
Triumph (British)	48
Tromp (Dutch)	385
Tsessarevitch (Russian)	341
Tsugaru (Japanese)	242
Tsukuba (Japanese)	226
Tsushima (Japanese)	240
Undaunted (British)	64
Undine (German)	138
Utah (U.S.A.)	168
Valiant (British)	33
Valkyrien (Danish)	379
Vanguard (British)	39
Varese (Italian)	300
Vasa (Swedish)	362
Vasco da Gama (Portuguese)	398
Venerable (British)	51
Vengeance (British)	53
Venus (British)	74
Vergniaud (French)	258
Verité (French)	259
Vermont (U.S.A.)	171
Vettor Pisani (Italian)	268
Victor Hugo (French)	302
Victoria Luise (German)	133
Victorious	54
Vindictive (British)	72
Vineta (German)	133
25 de Maio (Argentine)	
Virginia (U.S.A.)	319
Viribus Unitis (Austrian)	174
Vittorio Emanuele (Italian)	298
Voltaire (French)	258
Von der Tann (German)	124
Waldeck Rousseau (French)	265
Warrior (British)	57
Warspite (British)	33
Washington (U.S.A.)	179
Weissenburg (German)	117
Westfalen (German)	120
West Virginia (U.S.A.)	180
Wettin (German)	127
Weymouth (British)	66
Wien (Austrian)	322
Wisconsin (U.S.A.)	176
Wittelsbach (German)	127
Wörth (German)	128
Wyoming (U.S.A.)	167
Yahagi (Japanese)	239
Yakumo (Japanese)	237
Yarmouth (British)	66
Ying-Swei (Chinese)	451
Yodo (Japanese)	241
Yorck (German)	131
Zähringen (German)	127
Zealandia (British)	47
Zeeland (Dutch)	386
Zenta (Austrian)	326
Zeven Provincien (Dutch)	384
Zrinyi (Austrian)	320

ALPHABETICAL INDEX OF TORPEDO CRAFT.

D = Destroyer. T = Torpedo boat. T G = Torpedo gunboat. S = Submarine.

Abdul-Méjid (T) Turkish
Acaste (D) British
Acevedo (T) Spanish
Achates (D) British
Acheloos (TG) Greek
Acheron (D) British
Acorn (D) British
Actée (D) French
Adler (T) Austrian
Adyder (T) Turkish
Aetos (D) Greek
Afridi (D) British
Agile (T) French
Agordat (TG) Italian
Aigrette (S) French
Aintab (TG) Turkish
Airone (T) Italian
Ajanami (D) Japanese
Akebono (D) Japanese
Aktion (TG) Greek
Akula (S) Russian
Ak-Hissar (T) Turkish
Alagoas (D) Brazilian
Alarm (D) British
Albacore (D) British
Albatross (D) British
Albatross (T) Italian
Albione (T) Italian
Alice Roosevelt (T) Turkish
Alk (T) Austrian
Alligator (T) Austrian
Alligator (S) Russian
Ambuscade (D) British
Almirante Condell (TG) Chilian
Almirante Lynch (TG) Chilian
Almirante Simpson (T G) Ecuador
Alojoas (D) Brazilian
Alpheus (TG) Greek
Alpino (D) Italian
Alwyn (D) U.S.A.
Amazon (D) British
Amazonas (D) Brazilian
Ambrakia (TG) Greek
Amiral Bourgeois (S) French
Ammen (D) U.S.A.
Ampère (S) French
Amuretz (D) Russian
Anaconda (T) Austrian
Anastasoff (D) Russian
Andrew Sterrett (U.S.A.)
Angler (D) British
Angora (T) Turkish
Animoso (D) Italian
Antelope (T G) British
Aotaka (T) Japanese
Aphroessa (TG) Greek
Aquila (T) Italian
Aquilon (T) French
Aquilone (D) Italian

Arab (D) British
Arago (S) French
Arare (D) Japanese
Arbeióte (D) French
Arc (D) French
Archer (D) British
Archimede (S) French
Ardea (T) Italian
Ardent (D) British
Ardente (D) Italian
Ardito (D) Italian
Ardjeno (T) Dutch
Aretusa (T G) Italian
Argea (T) Roumanian
Argo (S) Italian
Argonaute (T) French
Ariake (D) Japanese
Arpia (T) Italian
Arquebuse (D) French
Artigliere (D) Italian
Arun (D) British
Asagiri (D) Japanese
Asakase (D) Japanese
Asashiho (D) Japanese
Asatsuyu (D) Japanese
Aspirante Herbert (D) French
Aspis (D) Greek
Assahan (TG) Dutch
Astore (T) Italian
Astrea (T) Swedish
Atrojo (S) Italian
Attack (D) British
Audacieux (T) French
Audace (D) Italian
Audaz (D) Spanish
Averne (T) French
Avon D (British)
Avtroll (D) Russian
Avvoltoio (T) Italian
Azard (D) Russian
Azor (T) Spanish

Boffra (T G) Turkish
Bagley (T) U.S.A.
Bailey (T) U.S.A.
Badger (D) British
Bainbridge (D) U.S.A.
Balaton (T) Austrian
Baleh (D) U.S.A.
Balliste (D) French
Baranoff, Leit (D) Russian
Barikaizaffer (T G) Turkish
Barney (T) U.S.A.
Barry (D) U.S.A.
Basilisk (D) British
Basra (T) Turkish
Bat (D) British
Batak (T) Dutch

Bathurst (T) Argentine
Bditelni (D) Russian
Beagle (D) British
Beale (D) U.S.A.
Beaver (D) British
Beller (D) French
Bellone (S) French
Benham (D) U.S.A.
Berak-Effshan (T) Turkish
Berk-i-Satvet (T) Turkish
Beranoille (S) French
Bersagliere (D) Italian
Berthelot (S) French
Beschunni (D) Russian
Bespokoiny (D) Russian
Besposchtschadni (D) Russian
Bestraschni (D) Russian
Bisson (D) French
Biddle (T) U.S.A.
Birban-ed-Din (T) Turkish
Bistri (T) Bulgarian
Bistry (D) Russian
Bittern (D) British
Blakely (T) U.S.A.
Blink (T) Norwegian
Blitz (T G) Austrian
Blixt (T) Swedish
Boa (T) Austrian
Bodry (D) Russian
Boiky (D) Russian
Bombarde (D) French
Bonetta (D) British
Bonifaz (TG) Spanish
Bonite (S) French
Borea (D) Italian
Borée (T) French
Bory (D) French
Boucher (D) French
Boucliee (D) French
Bourakoff (D) Russian
Bourrasque (T) French
Boute-feu (D) French
Boxer (D) British
Boyevoi (D) Russian
Boyne (D) British
Brand (T) Norwegian
Branlebas (D) French
Bravy (D) Russian
Brazen (D) British
Briatschelshaw (D) Russian
Bris (T) Swedish
Brisk (D) British
Bruiser (D) British
Brumaire (S) French
Buchardo (T) Argentine
Bulhond (TG) Dutch
Bulldog (D) British
Bullfinch (D) British
Burni (D) Russian
Burrows (D) U.S.A.

Bustamente (D) Spanish
Byaluga (S) Russian
Bytschok (S) Russian

Caerta (D) Brazilian
Calliope (T) Italian
Calypso (S) French
Cameleon (D) British
Canope (T) Italian
Cap. 2r. Kern (D) Russian
Cap. 2r. Kinshergen (D) Russian
Cap. 2r. Konon-Zotof (D) Russian
Cap. 2r. Krouw (D) Russian
Cap. 2r. Tschmettier (D) Russian
Capitan Merino Tarpa (D) Chilian
Capitan Munoz Gamero (D) Chilian
Capitan O'Brien (D) Chilian
Capitan Orella (D) Chilian
Capitan Thompson (D) Chilian
Caprera (T G) Italian
Carabine (D) French
Carabinier (D) French
Carabiniere (D) Italian
Carquois (D) French
Casabianca ( ) French
Casque (D) French
Cassini ( ) French
Cassin (D) U.S.A.
Cassiopea (T) Italian
Castor (T) Swedish
Castamoni (T G) Turkish
Catapulte (D) French
Catamarca (D) Argentine
Cavalier (D) French
Centauro (T) Italian
Cerberus (T) Dutch
Chang Yen (D) Chinese
Charger (D) British
Charles Brun (S) French
Charles Martel (S) French
Charles W. Flusser (D) U.S.A.
Chasseur (D) French
Chauncey (D) U.S.A.
Cheerful (D) British
Chelmer (D) British
Cherwell (D) British
Chidori (T) Japanese
Chios (D) Russian
Christopher (D) British
Cigno (T) Italian
Cigogne (S) French
Cimiterre (D) French
Circe (T G) British
Circé (S) French

Cirujano Videla (T) Chilian
Claes Hara (TC) Swedish
Clas Uggla (TC) Swedish
Claymore (D) French
Clio (T) Italian
Coalit (TG) Italian
Cobra (T) Austrian
Cockatrice (D) British
Cognée (D) French
Colne (D) British
Colomb (S) French
Comet (D) British
Commandant Lucas (D) French
Commodoro Py (T) Argentine
Condore (T) Italian
Conflict (D) British
Contest (D) British
Coquette (D) British
Corazziere (D) Italian
Cordoba (D) Argentine
Corrientes (D) Argentine
Cossack (D) British
Couteau (D) French
Crane (D) British
Craven (T) U.S.A.
Crusader (D) British
Csepel (T) Austrian
Csikos (D) Austrian
Cugnot (S) French
Cummings (D) U.S.A.
Curie (S) French
Cushing (D) U.S.A.
Cyclone (T) French
Cyclop (T) Dutch
Cygnet (D) British
Cynthia (D) British

Dague (D) French
Dahlgren (T) U.S.A.
Daphne (S) French
Dard (D) French
Dardo (D) Italian
Dale (D) U.S.A.
Davis (T) U.S.A.
Decatur (D) U.S.A.
Dee (D) British
Defender (D) British
Dehorter (D) French
Delfin (T) Norwegian
Delfin (S) Russian
Delfinen (T) Danish
Delfino (S) Italian
Delphin (S) Greek
De Long (T) U.S.A.
Delphin (T) Austrian
Dempo (T) Dutch
Dersky (D) Russian
Derwent (D) British

Desna (D) Russian
Desperate (D) British
Destructor (D) Spanish
Diane (S) French
D'Iberville (T G) French
Dinara (D) Austrian
Disa (TG) Swedish
Djerv (T) Norwegian
Dmitrieff (D) Russian
Dobrovoletz (D) Russian
Dona Alvaro de Bazan (T G) Spanish
Dona Maria de Molina (T G) Spanish
Donskoi-Kassack (D) Russian
Doon (D) British
Dostoini (D) Russian
Dove (D) British
Dourol (D) Portugese
Downes (D) U.S.A.
Doxa (D) Greek
Drak (T) Dutch
Drache (T) Austrian
Dragon (D) British
Drakon (S) Russian
Drauc (D) Norwegian
Dratch (T) Turkish
Drayton (T) U.S.A.
Dristig (T) Norwegian
Druid (D) British
Dryad (T G) British
Duncan (D) U.S.A.
Dunois (T G) French
Dupont (T) U.S.A.
Dupuy de Lome (S) French
Durandal (D) French
Dyelni (D) Russian
Dyejatelni (D) Russian
Dykkeren (S) Danish

Earnest (D) British
Echse (T) Austrian
Eclair (T) French
Eden (D) British
Edi (T G) Dutch
Edward R McCall (D) U.S.A.
Edward Terry (D) U.S.A.
Electra (D) British
Elagoel (T) Turkish
Emeraude (S) French
Emir Bucharski (D) Russian
Empong (T) Dutch
Enseigne Henry (D) French
Entre Rios (D) Argentine
Épée (D) French
Epieu (D) French
Ericsson (D) U.S.A.
Erne (D) British

Ertogrul (T G) Turkish
Escopette (D) French
Espadon (S) French
Espero (D) Italian
Espora (T) Argentine
Etandard (D) French
Etna (T) Dutch
Ettrick (D) British
Euro (D) Italian
Eurotas (T G) Greek
Exe (D) British
Express (D) British

Fair (T) Turkish
Fairy (D) British
Falco (T) Italian
Falcon (D) British
Falk (T) Norwegian
Falke (T) Austrian
Fame (D) British
Fanfare (D) French
Fanion (D) French
Fanning (D) U.S.A.
Fantassin (D) French
Faraday (S) French
Farfadet (S) French
Faragut (T) U.S.A.
Fauconneau (D) French
Faulx (D) French
Fawn (D) British
Feld Marshall-Graf-Skelremeteff (S) Russian
Fei-Ting (T G) Chinese
Fenet (D) British
Ferré (S) Peruvian
Fervent (D) British
Fetih (T) Turkish
Filibustier (T) French
Finn (D) Russian
Firedrake (D) British
Fisalia (S) Italian
Flamberge (D) French
Fleuret (D) French
Flirt (D) British
Floreal (S) French
Flusser (D) U.S.A.
Flying Fish (D) British
Flyvefisken (T G) Danish
Fo (T) Norwegian
Foca (S) Italian
Foam (D) British
Foka (T) Dutch
Foote (T) U.S.A.
Forban (T) French
Forel (S) Russian
Forester (D) British
Fortune (D) British
Fougasse (D) French

Fourche (D) French
Fox (T) U.S.A.
Foxhound (D) British
Foyle (D) British
Francis A. Roe (D) U.S.A.
Francisque (D) French
Frat (T G) Turkish
Freccia (D) Italian
Fresnel (S) French
Fret (T G) Dutch
Frimaire (S) French
Frithjof (T G) Norwegian
Fronde (D) French
Fructidor (S) French
Fubuki (D) Japanese
Fucilieri (Italian)
Fulmine (D) Italian
Fulton (S) French
Fumitzuki (D) Japanese
Fupo (D) Chinese
Fury (D) British

Gabbiano (T) Italian
Gabion (D) French
Galdamak (D) Russian
Garabaldino (D) Italian
Garland (D) British
Garnier (D) French
Garry (D) British
Gay Lussac (S) French
Gavrill (D) Russian
George H. Perkins (D) U.S.A.
Germinal (S) French
G. Ferraris (S) Italian
Ghurka (D) British
Giaura (T) Chilian
Giffard (S) French
Gilijom (T) Turkish
Gipsy (D) British
Glaive (D) French
Glauco (S) Italian
Glimt (T) Norwegian
Gniewny (D) Russian
Gnome (S) French
Goentoer (T) Dutch
Gogland (D) Russian
Goito (T G) Italian
Goldfinch (D) British
Goldsborough (T) U.S.A.
Gondul (T) Swedish
Gorgone (S) French
Goshawk (D) British
Gossamer (T) British
Goyaz (T) Brazilian
G. Pullino (S) Italian
Graf Sheremetreff (S) Russian
Granatiere (D) Italian
Grasshopper (D) British

ALPHABETICAL INDEX OF TORPEDO CRAFT.

D = Destroyer. T = Torpedo boat. T G = Torpedo gunboat. S = Submarine.

Graf (T) Austrian
Grenadier (T) French
Grengamm (D) Russian
Greyhound (D) British
Grib (T) Norwegian
Griden (T) Russian
Griffon (T) British
Grom (D) Russian
Gromky (D) Russian
Gromyastchy (D) Russian
Grondeur (T) French
Grosny (D) Russian
Grosovoi (D) Russian
Guardia Marina Contreras (T) Chilian
Guardia Marina Riquelme (D) Chilian
Gudur (T) Swedish
Gukjedah (T G) Turkish
Gustave-Zédé (S) French
Gustavo Sampaio (T G) Brazilian
Gwin (T) U.S.A.
Gymnote (S) French

Habana (T) Spanish
Habang (T) Dutch
Hache (D) French
Hai (T) Austrian
Hai (T) Norwegian
Haien (T) Danish
Hajen (S) Swedish
Halcon (T) Spanish
Halcyon (TG) British
Hallebarde (D) French
Hamid-Abad (T) Turkish
Hamidiyeh (T) Turkish
Hardy (D) British
Háryy (D) British
Harpon (D) French
Harrier (TG) British
Harukase (D) Japanese
Hashitaka (T) Japanese
Hasty (D) British
Hato (T) Japanese
Hatsuharu (D) Japanese
Hatsushimo (D) Japanese
Hatsuyuki (D) Japanese
Hauk (T) Norwegian
Havfruen (T G) Danish
Havhesten (T) Danish
Havmanden (T G) Danish
Havornen (T) Danish
Hayabusa (T) Japanese
Hayakase (D) Japanese
Hazard (TG) British
Hebe (TG) British
Hekla (T) Dutch

Henley (D) U.S.A.
Hermione (S) French
Hibari (T) Japanese
Hibiki (D) Japanese
Hind (D) British
Hiram Paulding (D) U.S.A.
Hollands 1-5 (S) British
Hope (D) British
Hopkins (D) U.S.A.
Hornet (D) British
Hull (D) U.S.A.
Hujan (T) Chinese
Huno (T) Chinese
Hupang (T) Chinese
Hussar (T G) British
Hussard (D) French
Huszar (D) Austrian
Hutschan (T) Chinese
Hval (T) Norwegian
Hvalen (S) Swedish
Hvas (T) Norwegian
Hydra (T) Austrian
Hydra (T) Dutch
Hyena (D) British

Idjen (T) Dutch
Ikadsuchi (D) Japanese
Impavado (D) Italian
Impetuoso (D) Italian
Inazuma (D) Japanese
Idomino (D) Italian
Ingeniero Hyatt (T) Chilian
Ingeniero Mutilla (T) Chilian
Insch. Mech. Anastassoff (T G) Russian
Insch. Mech. Dmitrieff
Insch. Mech. Sweroff
Insidioso (D) Italian
Intrepido (D) Italian
Iranami (D) Japanese
Inequieto (D) Italian
Iride (T) Italian
Iris (T) Swedish
Irrequieto (D) Italian
Iskussni (D) Russian
Ispoltetelni (D) Russian
Itchen (D) British

Jackal (D) British
Jacob Bagge (T C) Swedish
Jacob Hobein (T) Dutch
Jakhais (T G) Dutch
Jalea (S) Italian
Jan Haringh (T) Dutch
Janissaire (D) French
Janita (S) Italian
Jarky (D) Russian

Jarvis (D) U.S.A.
Jason (T G) British
Jasper Lijnsen (T) Dutch
Javeline (D) French
Jed (D) British
Jeevoi (D) Russian
Jeevutny (D) Russian
Jerek (D) Greek
Jenkins (D) U.S.A.
Jeressi (S) French
Johan van Brackel (T) Dutch
John Mayran (D) U.S.A.
Jorge (T) Argentine
Joseph B. Smith (D) U.S.A.
Joule (S) French
Jowett (D) U.S.A.
Jujuy (D) Argentine
Julian Ordonez (T) Spanish
Jutky (D) Russian

Kabyle (T) French
Kagero (D) Japanese
Kaifu (D) Japanese
Kaiman (T) Austrian
Kaiman (S) Russian
Kale (D) British
Kambala (S) Russian
Kamikaze (D) Japanese
Kamone (T) Japanese
Kanguro (D) British
Kap (D) Russian
Kapetta (T) Swedish
Kapitan-Jurassowski (D) Russ.
Kapitan-Leitenant Kasarski (T G) Russian
Kapitan Saken (D) Russian
Karas (S) Russian
Kari (T) Japanese
Karp (S) Russian
Kasanets (D) Russian
Kasasagi (T) Japanese
Kassatka (S) Russian
Kaschalot (T) Russian
Kasumi (D) Japanese
Kata (S) Russian
Kate (D) British
Kefal (S) Russian
Kennet (D) British
Keravnos (D) Greek
Kestrel (D) British
Khrabry (T) Bulgarian
Kien An (T G) Chinese
Kien Wei (T G) Chinese
Kidil-ul-Bahir (T G) Turkish
Kigyo (T) Austrian
Kiji (T) Japanese
Kikutsuki (D) Japanese
King (T) Argentine

Kisaragi (D) Japanese
Kit (T) Russian
Kjack (T) Norwegian
Kobben (S) Norwegian
Koetei (T G) Dutch
Komet (T) Swedish
Komet (T G) Austrian
Kondratenko (D) Russian
Koolm (D) Russian
Konstantin (D) Russian
Kormoran (T) Austrian
Korrigan (S) French
Krakatan (T) Dutch
Krake (T) Austrian
Krepki (D) Russian
Krokodil (S) Russian
Krokodil (T) Austrian
Krokodil (T) Dutch
Kusyoho (S) Japanese
Kvik (T) Norwegian

Laertes (D) British
Lafarey (D) British
Lagnange (S) French
La Hire (T G) French
Laks (T) Norwegian
Lamogan (T) Dutch
Lampo (D) Italian
Lamson (D) U.S.A.
Lancier (T) French
Lance (D) British
Landrail (D) British
Lansquenet (D) French
Lanziere (D) Italian
Laplace (S) French
La Plata (D) Argentine
Lapwing (D) British
Lark (D) British
Larne (D) British
Lastochka (D) Russian
Latte (D) French
Laurel (D) British
Lauria (TG) Spanish
Laverock (D) British
Lawford (D) British
Lawrence (D) U.S.A.
Laya (TG) Spanish
Leda (T G) British
Legion (D) British
Legki (D) Russian
Lieut. Belle (D) Russian
Lieut. Doohasor (D) Russian
Lieut. Illin (D) Russian
Lieut. Lourhardo (D) Russian
Leit. Pushtscheen (D) Russian
Lennox (D) British
Leon (D) Greek
Leonidas (D) British

Leopard (D) British
Letutschi (D) Russian
Leven (D) British
Lewis Warrington (D) U.S.A.
Liberty (D) British
Lietoon (D) Russian
Lika (T) Austrian
Liffey (D) British
Lightning (D) British
Likoi (D) Russian
Linnet (D) British
Lively (D) British
Lizard (D) British
Llewellyn (D) British
Locust (D) British
Lonchi (D) Greek
Lookout (D) British
Losos (S) Russian
Louis (D) British
Lowki (D) Russian
Loyal (D) British
Lucas (D) French
Luctor et Emergo (S) Dutch
Lureker (D) British
Lutte (D) French
Lucifer (D) British
Lung Suan (D) Chinese
Lydiard (D) British
Lyn (T) Norwegian
Lynch (D) British
Lyra (D) British
Lysander (D) British

Macdonough (D) U.S.A.
Mackenzie (T) U.S.A.
Magne (D) Swedish
Magnet (T G) Austrian
Magon (D) French
Mahabat (T) Turkish
Makjan (T) Dutch
Makrelen (T) Danish
Makrel (S) Russian
Malatia (T G) Turkish
Malejeff (D) Russian
Mallard (D) British
Mameluk (D) French
Manazuru (T) Japanese
Mangini (D) French
Manley (T) U.S.A.
Maori (D) British
Margarita (T G) Venezuelan
Mariotte (S) French
Marques de la Victoria (T G) Spanish
Marques de Molins (T G) Spanish
Marmaris (T G) Turkish
Mariotte (S) French

Martin (D) British
Massue (D) French
Mataram (T G) Dutch
Matsukase (D) Japanese
Matto Grosso (D) Brazilian
Mayran (D) U.S.A.
McDougal (D) U.S.A.
McCall (D) U.S.A.
Medusa (S) Italian
Mehl (D) French
Mendoza (D) Argentine
Mermaid (D) British
Messidor (S) French
Meteor (T) Swedish
Meteor (T G) Austrian
Metki (D) Russian
Michail (D) Russian
Midge (D) British
Mikazuki (D) Japanese
Minatsuki (D) Japanese
Minerva (T G) Italian
Minoga (S) Russian
Minotaurus (T) Dutch
Minstrel (D) British
Mira (T) Swedish
Missiones (D) Argentine
Mistral (T) French
Mode (D) Swedish
Moewe (T) Austrian
Mohawk (D) British
Molche (T) Austrian
Molodetski (D) Russian
Monaghan (D) U.S.A.
Monge (S) French
Montebello (T G) Italian
Montgolfier (S) French
Morris (T) U.S.A.
Morse (S) French
Morsch (T) Russian
Mortier (D) French
Moschtschi (D) Russian
Moskwityanin (D) Russian
Mosoul (T) Turkish
Mousquet (D) French
Mousqueton (D) French
Mosquito (D) British
Mouvenet-Milleh (T) Turkish
Moy (D) British
Murakumo (D) Japanese
Murasame (D) Japanese
Muratore (T) Argentine
Myrmidon (D) British

Nadiejda (T G) Bulgarian
Nagatsuki (D) Japanese
Nalim (S) Russian
Naluca (T) Roumanian
Naphkratoussa (D) Greek

Narhvalen (T) Danish
Narval (T) Russian
Narvalo (S) Italian
Narwal (T) Austrian
Nassir (T) Turkish
Nautilus (S) British
Nautilus (S) Italian
Neagenes (D) Greek
Nedea (T) Roumanian
Nembo (D) Italian
Nemesis (D) British
Nenohi (D) Japanese
Nerchehir (T G) Turkish
Nereide (D) British
Néréide (S) French
Nereide (S) Italian
Nerpa (T) Russian
Ness (D) British
Newton (S) French
Nia (T G) Chinese
Nibbio (T) Italian
Nicholson (T) U.S.A.
Nicholson (D) U.S.A.
Niger (T G) British
Nike (D) Greek
Nimet (T) Turkish
Nith (D) British
Nivose (S) French
Nobo (T) Dutch
Nordkaperen (T) Danish
Norik (D) Russian
Nouribahar (T G) Turkish
Nowake (D) Japanese
Noumouneï-Hamlet (T) Turkish
Nublan (D) British
Nueva Espana (T G) Spanish
Nusret (T) Turkish
Nymphe (D) British

Oak (D) British
Obero (D) Japanese
O'Brien (T) U.S.A.
Obusier (D) French
Ochotnik (D) Russian
Oite (D) Japanese
Okun (S) Russian
Olimpia (T) Italian
Opale (S) French
Ophir (T) Dutch
Opossum (D) British
Orage (T) French
Orfeo (T) Italian
Orgen (T) Austrian
Oriflamme (D) French
Orion (T) Spanish
Orion (T) Swedish
Orione (T) Italian
Orkan (T) Swedish

Orn (T) Norwegian
Ornen (T C) Swedish
Ormen (T G) Danish
Orphey (D) Russian
Orsa (T) Italian
Orwell (D) British
Osado (D) Spanish
Osprey (D) British
Ossetyr (S) Russian
Ostrich (D) British
Ostro (D) Italian
Otaria (S) Italian
Otori (T) Japanese
Otter (D) British
Ourfia (T) Turkish
Ouse (D) British
Owl (D) British

Palacious (S) Peruvian
Palfade (T) Italian
Paltus (S) Russian
Pandur (D) Austrian
Pangrango (T) Dutch
Panther (D) British
Papin (S) French
Para (D) Brazilian
Paragon (D) British
Parahyba (D) Brazilian
Parados (T G) Greek
Parana (D) Brazilian
Parker (D) U.S.A.
Parramatta (D) Australian
Partenope (T G) Italian
Patrass (D) Russian
Patria (T) Argentine
Patterson (D) U.S.A.
Paul Jones (D) U.S.A.
Paulding (D) U.S.A.
Pedro-Ivo (T) Brazilian
Pegaso (T) Italian
Peïk-i-Shevket (T G) Turkish
Pelenk-i-Deria (T G) Turkish
Pellicano (T) Italian
Penens (T G) Greek
Penguin (T) Austrian
Percival Drayton (D) U.S.A.
Perkins (D) U.S.A.
Perry (D) U.S.A.
Perseo (T) Italian
Perseus (T) Swedish
Pertuisane (D) French
Pervim (T) Turkish
Peskar (S) Russian
Peterel (D) British
Phœnix (D) British
Phönix (T) Austrian
Pianhy (D) Brazilian
Pierrier (D) French

ALPHABETICAL INDEX OF TORPEDO CRAFT.

D = Destroyer. T = Torpedo boat. T G = Torpedo gunboat. S = Submarine.

Pincher (D) British
Pinedo (T) Argentine
Pique (D) French
Pistolet (D) French
Planet (T G) Austrian
Plejad (T) Swedish
Plongeur (S) Portuguese
Plotwa (S) Russian
Pluvoise (S) French
Pobieditel (D) Russian
Podvischny (D) Russian
Pogranitschisk (D) Russian
Poignard (D) French
Polaris (T) Swedish
Pollux (T) Swedish
Polyp (T) Austrian
Pontieri (D) Italian
Porashoschstwy (D) Russian
Porcupine (D) British
Porpoise (D) British
Porter (T) U.S.A.
Posluschny (D) Russian
Pospyechny (D) Russian
Potersnl (T) Roumanian
Potschowy (S) Russian
Preble (D) U.S.A.
Preston (D) U.S.A.
Priamishaw (D) Russian
Pritky (D) Russian
Procione (T) Italian
Prousitelny (D) Russian
Proserpina (D) Spanish
Prosorlivy (D) Russian
Protet (D) French
Protschny (D) Russian
Pulky (D) Russian
Pulander (T G) Swedish
Pushkin, Leit (D) Russian
Pyley (D) Russian
Python (T) Austrian
Python (T) Dutch

Quail (D) British
Qutahia (T) Turkish

Racehorse (D) British
Racoon (D) British
Rafale (T) French
Ragnar (D) Swedish
Raket (T) Norwegian
Ranger (D) British
Rapiere (D) French
Rastoropni (D) Russian
Rasyaschtschi (D) Russian
Rattlesnake (D) British
Raun (T) Norwegian
Recalde (T G) Spanish
Recaldoni (S) Argentine
Recruit (D) British
Redpole (D) British
Refadi (T G) Turkish
Regnault (S) French
Regulus (T) Swedish
Reid (D) U.S.A.
Renard (D) British
Renaudin (D) French
Reka (D) Austrian
Retivy (D) Russian
Revolver (D) French
Ribbie (D) British
Rifleman (D) British
Rigel (T) Swedish
Rindjani (T) Dutch
Rio Grande der Norte (D) Brazilian
Rioja (D) Argentine
Rivière (D) French
Rodgers (T) U.S.A.
Roe (D) U.S.A.
Roebuck (D) British
Roswell H. Lampson (D) U.S.A.
Rother (D) British
Rowan (T) U.S.A.
Rubis (S) French
Ruby (D) British
Ryany (D) Russian
Rylsky (D) Russian
Rymnick (D) Russian

Sabre (D) French
Sabretache (D) French
Sael (T) Norwegian
Saffo (T) Italian
Sagaie (D) French
Sagi (T) Japanese
Sagittario (T) Italian
Saiki (T) Turkish
Salaminia (T G) Greek
Salta (D) Argentine
Sakura (D) Japanese
Salpa (S) Italian
Samsoun (T) Turkish
Samuel W. Preston (D) U.S.A.
Samuel C. Reid (D) U.S.A.
Sandfly (D) British
San Juan (D) Argentine
San Luis (D) Argentine
Santa Catarina (D) Brazilian
Santa Fé (D) Argentine
Santinela (T) Roumanian
Santiago (D) Argentine
Sape (D) French
Saphir (S) French
Sarabacane (D) French
Saracen (D) British
Sarky (D) Russian
Satellit (T G) Austrian
Satsuki (D) Japanese
Satvet (T) Turkish
Savage (D) British
Savetny (D) Russian
Savitny (D) Russian
Sazanami (D) Japanese
Scharfschütze (D) Austrian
Schtschuka (S) Russian
Schwalbe (T) Austrian
Scorpion (D) British
Scorpione (T) Italian
Scourge (D) British
Scylla (T) Dutch
Seagull (T G) British
Seal (D) British
Seal (S) U.S.A.
Seehund (T) Austrian
Sef-i-Bahri (T) Turkish
Serdang (T G) Dutch
Serdity (D) Russian
Sergieff (D) Russian
Sergipe (D) Brazilian
Serpente (T) Italian
Seyad (T G) Turkish
Sfendoni (D) Greek
Shahin-i-Deria (T G) Turkish
Shamanever (T) Turkish
Shark (D) British
Shark (S) U.S.A.
Sharpshooter (T G) British
Sheldrake (D) British
Shen (T G) Chinese
Shigure (D) Japanese
Shihab (T) Turkish
Shimshir-i-Hidsum (T) Turkish
Shinonome (D) Japanese
Shirakumo (D) Japanese
Shiranui (D) Japanese
Shirataka (T) Japanese
Shiratsuyu (D) Japanese
Shirayuki (D) Japanese
Shirotave (D) Japanese
Shivoi (D) Russian
Shivulka (D) Russian
Shubrick (T) U.S.A.
Shutki (D) Russian
Siberski-Strelok (D) Russian
Siboga (T G) Dutch
Sig (S) Russian
Sigurd (D) Swedish
Sild (T) Norwegian
Silni (D) Russian
Silure (S) French
Silvado (T) Brazilian
Simoun (T) French
Sirène (S) French
Sirio (T) Italian
Sirius (T) Swedish
Sirocco (T) French
Sivre-Hissar (T) Turkish
Skaggle (T G) Swedish
Skarv (T) Norwegian
Skat (S) Russian
Skipjack (T G) British
Skory (D) Russian
Skorpion (T) Austrian
Skrei (T) Norwegian
Skuld (T G) Swedish
Sleipner (D) German
Slorul (T) Roumanian
Smeli (T) Bulgarian
Smeroe (T) Dutch
Smetlivy (D) Russian
Smeul (T) Roumanian
Smith (D) U.S.A.
Smyely (D) Russian
Sobjornen (T) Danish
Soridderen (T G) Danish
Soimul (T) Roumanian
Soloven (T) Danish
Som (S) Russian
Somers (T) U.S.A.
Soulfen (T G) Danish
S. Percival Drayton (D) U.S.A.
Spackhuggeren (T G) Danish
Spahi (D) French
Spanker (T G) British
Sparrowhawk (D) British
Sparviero (T) Italian
Speedwell (T G) British
Speedy (T G) British
Sphinx (T) Dutch
Spiteful (D) British
Spica (T) Swedish
Spica (T) Italian
Spitfire (D) British
Sprightly (D) British
Squalo (S) Italian
Ssamson (D) Russian
Ssmolensk (D) Russian
Ssokol (D) Russian
Stag (D) British
Star (D) British
Statny (D) Russian
Stauneh (D) British
Stavropolski-Truchmenets (D) Russian
Steregouchi (D) Russian
Sterliad (S) Russian
Sterrett (D) U.S.A.
Stewart (D) U.S.A.
Stiletto (T) U.S.A.
Stirssooden (D) Russian
Stjerna (T) Swedish
Storoschevol (D) Russian
Stockton (T) U.S.A.
Storen (T) Danish
Storm (D) Greek
Storm (T) Norwegian
Stour (D) British
Strale (D) Italian
Strashni (D) Russian
Streiter (D) Austrian
Stremitelny (D) Russian
Stringham (T) U.S.A.
Striony (D) Russian
Strogy (D) Russian
Stschastliry (D) Russian
Stylet (D) French
Su (T G) Chinese
Sua-Tayara-Schol (D) Siamese
Success (D) British
Sultan-Hissar (T) Turkish
Sunfish (D) British
Surly (D) British
Svaerdfisken (T) Danish
Svendsksund (T G) Swedish
Svirepy (D) Russian
Swale (D) British
Swift (D) British
Swonky (D) Russian
Swordfish (D) British
Sylvia (D) British
Syren (D) British
Syros (T G) Greek

Tajjar (T) Turkish
Takou (D) French
Taku (D) British
Taku (D) German
Tachkeuprin (T G) Turkish
Tamoyo (T G) Brazilian
Tangka (T) Dutch
Tarik (T) Turkish
Tartar (D) British
Taschibana (D) Japanese
Tassos (T) Turkish
Tatra (T) Austrian
Tchung (T G) Chinese
Teazer (D) British
Teist (T) Norwegian
Tejo (D) Portuguese
Telcerman (T) Roumanian
Tenedoss (D) Russian
Teniente Rodriguez (T) Chilian
Teniente Serrano (D) Chilian
Terror (D) Spanish
Terry (D) U.S.A.
Test (D) British
Teviot (D) British
Tewfik (T) Turkish
Theodor Sstratilat (D) Russian
Thetis (T) Swedish
Thyella (D) Greek
Thorn (D) British
Thorne (T) Argentine
Thornton (T) U.S.A.
Thrasher (D) British
Thyella (D) Greek
Timbira (T G) Brazilian
Tigress (D) British
Timur-Hissar (T) Turkish
Tingey (T) U.S.A.
Tiradentes (T G) Brazilian
Tirailleur (D) French
Tir-i-Safer (T) Turkish
Tocad (T) Turkish
Tone (D) Chilian
Topaze (S) French
Totschni (D) Russian
Tourbillon (T) French
Tourmente (T) French
Trabant (T) Austrian
Tramontane (T) French
Trevoschni (D) Russian
Tricheco (S) Italian
Trident (D) French
Triglav (T) Austrian
Tripoli (T) Italian
Trippe (D) U.S.A.
Triton (S) French
Triton (T) Austrian
Trods (T) Norwegian
Troll (D) Norwegian
Trombe (T) French
Trombion (D) French
Trotus (T) Roumanian
Truxton (D) U.S.A.
Tschestakoff, Leit (D) Russian
Tsubame (T) Japanese
Tucuman (D) Argentine
Tumiceren (T G) Danish
Tuono (D) Italian
Tupy (T G) Brazilian
Tural (D) Austrian
Turbine (D) Italian
Turbot (S) U.S.A.
Turco (T) French
Turkmenets-Staveopolosny (D) Russian
Turquoise (S) French
Twerdi (D) Russian
Typhon (T) French
Tyuleny (T) Russian

Ukraina (D) Russian
Ulan (D) Austrian
Umikaj (D) Japanese
Uranami (D) Japanese
Urd (T G) Swedish
Ure (D) British
Ushio (D) Japanese
Usk (D) British
Uskoke (D) Austrian
Ussurietz (D) Russian
Usugumo (D) Japanese
Utsuki (D) Japanese
Uzura (T) Japanese

Valkyrien (D) Norwegian
Varg (T) Norwegian
Vega (T) Swedish
Velebit (D) Austrian
Veletla (S) Italian
Véloce (T) French
Villamil (D) Spanish
Velox (D) British
Vêntose (S) French
Vesdli-i-Nusret (T) Turkish
Vesta (T) Swedish
Vidny (D) Russian
Vigilant (D) British
Viking (D) British
Viking (T G) Norwegian
Vind (T) Swedish
Vindkunden (T G) Danish
Vinoslivi (D) Russian
Violet (D) British
Virago (D) British
Virgo (T) Swedish
Vixen (D) British
Vlastni (D) Russian
Vnimatelni (D) Russian
Vnuschitelni (D) Russian
Voiskovoi (D) Russian
Volta (S) French
Voltigeur (D) French
Vsadnik (D) Russian
Vulcan (T Depot) British
Vultural (T) Roumanian
Vulture (D) British
Villamil (D) Spanish

Wajang (T) Dutch
Wakaba (D) Japanese
Wal. (T) Austrian
Wale (D) Swedish
Walker (D) U.S.A.
Warden (D) U.S.A.
Warrington (D) U.S.A.
Watt (S) French
Wavency (D) British
Wear (D) British
Welland (D) British
Whipple (D) U.S.A.
Whiting (D) British
Wildfang (D) Austrian
Wilkes (T) U.S.A.
William Burrows (D) U.S.A.
Winslow (T) U.S.A.
Wizard (D) British
Wladimir (D) Russian
Wolf (D) British
Wolf (T G) Dutch
Wolverine (D) British
Wörden (D) U.S.A.

Yadikiar Milet (S) Turkish
Yamikaje (D) Japanese
Yamahiko (D) Japanese
Yarra (D) Australian
Yar-Hissar (T) Turkish
Yatagan (D) French
Younis (T) Turkish
Yayoi (D) Japanese
Yen-Yun (D) Chinese
Yozgad (T G) Turkish
Yudachi (D) Japanese
Yugiri (D) Japanese
Yugure (D) Japanese
Yunagi (D) Japanese

Zabiaka (D) Russian
Zabiakaletz (D) Russian
Zazarennyi (D) Russian
Zavetny (D) Russian
Zavidny (D) Russian
Zebra (D) British.
Zeeslang (T) Dutch
Zefiro (D) Italian
Zephyr (D) British
Ziphias (T) Greek
Zaeo (S) Italian
Zolbeis (D) Greek
Zorky (D) Russian
Zuhof (T G) Turkish
Zulu (D) British
Zvonky (D) Russian

GLOSSARY OF TECHNICAL TERMS.

ENGLISH.	GERMAN.	FRENCH.	ITALIAN.	RUSSIAN.	RUSSIAN.	SPANISH.	SWEDISH.	DUTCH.
1 Above water	1 Ober wasser	1 Au dessus de l'eau	1 Sopracqua	1 Надводные	1 Nadvodnie	1 Sobre el agua	1 Ofvervattens	1 Boven water
2 Armour	2 Panzer	2 Cuirasse	2 Corazzato	2 Броня	2 Bronja	2 Coraza Blindage	2 Pansar	2 Pantser
3 Armoured cruiser	3 Gepanzerter Kreuzer	3 Croiseur cuirassé	3 Incrociatore corazzati	3 Броненосный-крейсеръ	3 Bronenosnii-kreiser	3 Crucero acorazado	3 Pansarkryssare	3 Gepantserde Kruiser
4 Ahead	4 Vorwärts	4 Avant	4 A prora (davanti)	4 Впередъ	4 Vpered	4 A proa	4 Framat	4 Vooruit
5 Astern	5 Rückwärts	5 Arrière	5 A poppa	5 Назадъ	5 Nazad	5 A pôpa	5 Back	5 Achteruit
6 Amidships	6 Mittschiffs	6 Au milieu	6 Al centro	6 Въсередину	6 Vseredinu	6 Al centro	6 Midskepps	6 Midscheeps
7 Barbettes	7 Brustwerk	7 Barbettes	7 Barbette	7 Барбеты	7 Barbeti	7 Torres-barbetas	7 Barbettorn	7 Barbette
8 Bases (of barbettes)	8 Trunk (Schacht)	8 Au dessous la tourelle	8 Piattoforme	8 Внизу	8 Vnizu	8 Plataformas	8 Fasta torn	8 Torenwal
9 Battery	9 Batterie	9 Batterie	9 Batteria	9 Баттарея	9 Battereya	9 Bateria	9 Batteri	9 Battery
10 Battleship	10 Schlachtschiff	10 Cuirassé d'escadre	10 Nave da battaglia	10 Броненосецъ	10 Bronenosets	10 Acorazado	10 Slagskepp	10 Flagschip
11 Beam	11 Breite	11 Largeur	11 Larghezza	11 Ширина	11 Shirina	11 Manga	11 Bredd	11 Breedery
12 Belt	12 Gürtel	12 Ceinture	12 Cintura	12 Поясъ	12 Poyass	12 Faja	12 Gördelpansar (citade)	12 Gordel
13 Bow	13 Bug	13 Avant	13 Prora	13 Носъ	13 Noss	13 Proa	13 Bog [eller gördel]	13 Boeg
14 Boilers	14 Kessel	14 Generateurs	14 Caldaie	14 Котлы	14 Kotli	14 Calderas	14 Ångpannor	14 Ketels
15 Bulkheads	15 Querwände	15 Traverses	15 Paratie	15 Переборки	15 Pereborki	15 Manpanos	15 Tvärpansar	15 Schot
16 Bridge	16 Brücke	16 Pont	16 Ponte di comando	16 Мостъ	16 Most	16 Puente	16 Brygga	16 Brug
17 Bunkers	17 Bunker	17 Soutes	17 Carbonili	17 Угольные ящики	17 Ugolnie yastchiki	17 Carboneras	17 Kolboxar	17 Kolenruimnén
18 Capacity	18 Capacität	18 Approvisement	18 Capacita	18 Помѣщение	18 Poinyestchenie	18 Capacidad	18 Kapacitet	18 Vermogen
19 Casemates	19 Casematten	19 Casemates	19 Casamette	19 Казематъ	19 Kazemat	19 Casamatas	19 Kasematter	19 Kazemat
21 Coal	21 Kohlenvorrat	21 Charbon	21 Carbone	21 Уголь	21 Ugol	21 Carbon	21 Kol	21 Steenkolen
22 Complement	22 Besatzung	22 Équipage	22 Equipaggio	22 Комплектъ	22 Kompleki	22 Dotacion	22 Besättningsstyrka	22 Bemanning
23 C.T. (conning tower)	23 Commando Turm	23 Block-haus (C.T.)	23 Torre di comando	23 Рулевая башня	23 Roolevaia bashnia	23 Torre de mando	23 Styrtorn	23 Commando-toren
24 Cruiser	24 Kreuzer	24 Croiseur	24 Incrociatore	24 Крейсеръ	24 Kreiser	24 Crucero	24 Kryssare	24 Kruiser
25 Deck	25 Deck	25 Pont	25 Ponte	25 Палуба	25 Palooba	25 Cubierta	25 Däck	25 Dek
26 Destroyer	26 Zerstörer	26 Contre-torpilleur	26 Caccia-torpediniere	26 Контръ-миноносецъ	26 Kontr-minonosets	26 Cazatorpederos	26 Jagare	26 Torpedobooljager
27 Displacement	27 Deplacement	27 Déplacement	27 Dislocamento	27 Водоизмѣщеніе	27 Vodoizmiestchenie	27 Desplazamiento	27 Deplacement	27 Waterverplaatsing
28 Draught	28 Tiefgang	28 Tirage	28 Immersione	28 Углубленіе	28 Ooglooblenie	28 Puntal	28 Djupgaende	28 Diepgang
29 Ends	29 Ends	29 Extrémités	29 Estremita	29 Край	29 Krai	29 Extremos	29 Stafvar	29 Einden
30 Fighting tops	30 Marsen	30 Hunes	30 Coffe militari	30 Пушечный марсъ	30 Poostchechnii mars	30 Cofas militares	30 Militärmaster	30 Gevechtsmars

30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
(Fighting tops *Shento-Shorow*)	(Ends *Hashi*)	(Draught *Kissui*)	(Displacement *Tai-sui-Tonsu*)	(Destroyer *Kuchiku-tei*)	(Deck *Kanpan*)	(Cruiser *Junyo-Kan*)	(C. T. (Conning tower) *Shireito*)	(Complement *Teiin*)	(Coal *Sheki tan*)	(c/m (*Centimetre*))	(Casemates *Kaku-Hodai*)	(Capacity *Yoryo*)	(Bunkers *Sheki tanko*)	(Bridge *Kankio*)	(Bulkheads *Kakuheki*)	(Boilers *Kikan*)	(Bow *Kanshu*)	(Belt *Kotai*)	(Beam *Haba*)	(Battleship *Shento-Kan*)	(Battery *Hodai*)	(Bases (of Barbettes, etc.) *Hoto-no-Kibu*)	(Barbettes *Rohoto*)	(Amidships *Chuo*)	(Astern *Tsuio*)	(Ahead *Omote*)	(Armoured Cruiser *Kotetsu-Junyo-Kan*)	(Armour *Kotetsu*)	Above water
戰鬪櫓樓	両端	吃水	排水噸數	驅逐艦	甲板	巡洋艦	司令塔	定員	石炭	センチメーター	穹窖砲臺	容量	石炭庫	艦橋	隔壁	瀛罐	艦首	甲帶	巾	戰鬪艦	砲臺	砲塔の基部	露砲塔	中央	艦後	艦前	甲鐵巡洋艦	甲鐵	水上

GLOSSARY OF TECHNICAL TERMS.

	ENGLISH.	GERMAN.	FRENCH.	ITALIAN.
31	Funnels	Schornsteine	Cheminées	Fumaioli
32	Guns	Geschütze	Artillerie	Cannoni
33	Hoods	Cupoles	Carapaces	Scudi
34	Kts. (Knots)	See-milen	Nœuds	Nodi
35	Length	Länge	Longeur	Lunghezza
36	Liquid Fuel	Petroleum	Combustile liquide	Combustibile liquido
37	Lower deck	Zwischen-deck	Faux pont	Ponte inferiore
38	Machinery	Maschinen	Machines	Machinaria
39	Main-deck	Batterie deck	Pont de batterie	Ponte principale
40	Masts	Masten	Mâts	Alberi
44	Port (side)	Backbord [Maschinen	Babord	Sinistra
45	Protection to vitals	Protektion an Schutz der	Protection des	Protezione delle parti
46	Ram	Ramsporn	Eperon [machines	Sperone [vitali
47	Screens	Splitter-traversen	Écrans	Schermi
48	Shields	Schützschildern	Boucliers.	Scudi
49	Speed	Geschwindigkeit	Vitesse	Velocita
50	Starboard	Steuerbord	Tribord	Dritta
51	Stern	Heck	Arrière	Poppa
52	Submarine	Untersee-Boote	Sousmarin	Sottomarino
53	Submerged	Unterwasser	Submergé	Subacqueo
54	Torpedo	Torpedo	Torpille	Siluro
55	Torpedo boat	Torpedo boot	Torpilleur	Torpediniera
56	Torpedo tubes	Torpedo lancier-röhre	Tubes lance torpille	Tubi lancia siluri
57	Tons	Tonnen	Tons	Tonnelate
58	Trials	Probefahrten	Essais	Prove
59	Turrets	Thürme	Tourelles	Torri
60	Upper deck	Oberdeck	Pont de gaillards	Ponte superiore
61	Water line	Wasserlinie	Flotation	Linea d'acqua

	RUSSIAN.	RUSSIAN.	SPANISH.	SWEDISH.	DUTCH.
31	Трубы	Trubi	Chimeneas	Skorstenar	Schoorsteen
32	Орудія	Orudiia	Cañones	Kanoner	Kanonnen
33	Покрышки	Pokrishki	Carapachos	Kåpor	Pantserkoepel
34	Узелъ	Uzell	Millas	Knop	Knoopen (my len)
35	Длина	Dlina	Eslora	Längd	Lengte
36	Жидкое топливо	Jhidkoe toplivo	Combustibele liquido	Flytande bränsle	Vloeibare brandstof
37	Нижняя палуба	Nijhniaia paluba	Cubierta baja	Trossdäck	Tusschendeks
38	Механизмъ	Mekhanizm	Máquinas	Maskineri	Werktuigen (machines)
39	Главная палуба	Glavnaia paluba	Cubierta principal	Batteridäck	Kuildek
40	Мачты	Machti	Palos	Master	Masten
44	Лѣвый	Lievii	Babor	Babord	Bakboord
45	Защита	Zastchita	Protection de las partes	Skydd för vitala delar	Bescherming der vitale
46	Тарань	Tarann	Espolon [vitales		Ram [deelen
47	Ширмы	Shirmi	Pantallas	Splinterskärmar	Splinterschilden
48	Щитъ	Stchit	Mantelete	Kanonskärmar	Schilden [Schermen
49	Скорость хода	Skorost khoda	Velocidad	Fart	Vaart, Snelheid
50	Правая сторона	Pravaia storona	Estribor	Styrbord	Stuurboord
51	Корма	Korma	Popa	Akter	Hek
52	Подводная-лодка	Podvodnaia lodka	Submarino	Undervattens	Onderzeetorpedoboot
53	Подводный	Podvodnii	Sumergido	Undervattens	Onderwater
54	Мина	Mina	Torpedo	Torpedo	Torpedo
55	Миноносецъ	Minonosets	Torpedero	Torpedbat	Torpedoboot
56	Минные апараты	Minnie aparati	Tubos lanza torpedos	Torpedtuber	Lanceerinridiling (Cuis
57	Тонны	Tonni	Toneladas	Ton	Tonnen of Kanon)
58	Испытанія	Ispitaniia	Pruebas	Proftur	Proeftocht
59	Башня	Bashnia	Torres	Rörliga torn	Torens
60	Верхняя палуба	Verkhniaia paluba	Cubierta alta	Ofre däck	Opperdek
61	Ватерлиниія	Vaterliniia	La linea de flotacion	Vattenlinie	Waterlyn

JAPANESE.
(pronounce as French.)

| | | |

FIGHTING SHIPS IDENTIFICATION OF WARSHIPS SIGNAL SYSTEM.

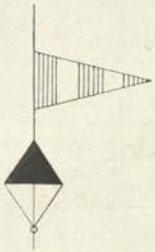
This system is put forward to allow of any merchantman being used as a war-scout without being supplied with naval signalmen—a copy of FIGHTING SHIPS being the sole requisite. However unfamiliar the merchantman may be with warships, the arrangement of the identification silhouettes is such that should any error be made, the receiver by a glance at the identification silhouettes can at once estimate it. Special notes of the chances of error are also made.

INSTRUCTIONS.

In the identification silhouettes on the index page of each navy, letters are assigned to each navy, and to each *class* of ships or series of ships practically identical in appearance.

PREPARATIVE.

The ship wishing to communicate by this code hoists a CONE under her ensign. The significance of this signal is—*following signals are by F.S. Code and refer to warships that I have sighted.* This should be kept up all the time that signalling by this system is going on.



ANSWERING.

Hoist the INTERNATIONAL CODE FLAG with a CONE below it. This signifies *I am able to understand the F.S. Code, and am ready to take in your message in International Code.*

This is to be kept up the whole of the time the signalling is being received. In case there is any difficulty in reading the signals, then this answering signal is to be lowered to the dip. This signifies "*Repeat Message.*"

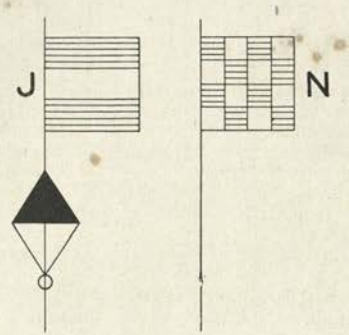
PROCEDURE.

The ship communicating then proceeds as follows:

First hoist.—The identification signal for the nationality of ship or ships sighted.

Second hoist.—Identification letters of ships that it is desired to indicate.

Signals to be hoisted where they can be best seen.



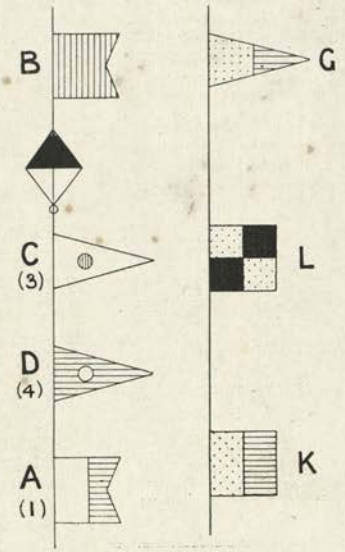
First hoist. *Second hoist.*

The significance of this signal is:—"*I have sighted the Japanese warship* (J cone) *Kawachi* or *Settsu* (N)."

NOTES.

If several ships of one class are to be indicated, a numeral should be hoisted *under* the cone of the first hoist. *Any flag under a cone has numerical significance* and no numeral flag is required. (*See Examples*).

If several ships of two or more classes are to be indicated, the necessary signals for two or three classes can be made as per example with a long tack between each combination.



First hoist. *Second hoist.*

The significance of this signal is:—"*I have sighted a fleet of British warships, consisting of the following vessels:—*

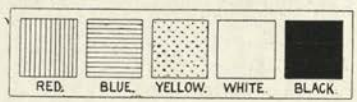
3 Orion class,

4 St. Vincent class,

1 Neptune.

The special nationality signals are:

A cone,	Austro-Hungarian
B	,,	British.
C	,,	Chilian.
D	,,	Danish.
E	,,	Argentine.
F	,,	French.
G	,,	German.
H	,,	Dutch.
I	,,	Italian.
J	,,	Japanese.
K	,,	Chinese.
M	,,	Swedish.
N	,,	Norwegian.
O	,,	Greek.
P	,,	Portuguese.
R	,,	Russian.
S	,,	Spanish.
T	,,	Turkish.
U	,,	United States.
Z	,,	Brazilian.
X	,,	*Unknown Nationality.*



(Key to colour symbols used in these illustrations).

SUBSTITUTES.

Substitutes for use with this code are:

1st substitute.—INTERNATIONAL CODE FLAG.

2nd substitute.—OWN ENSIGN.

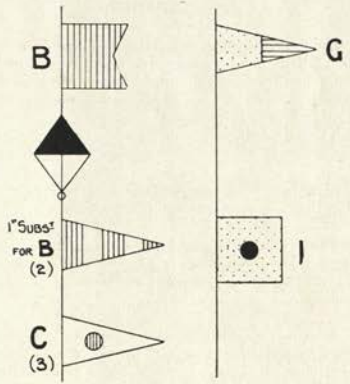
3rd substitute.—PILOT-BOAT FLAG *or* PILOT JACK.

4th substitute.—A ball.

(*See examples on next page*).

SIGNAL SYSTEM.

SPECIMEN OF A SUBSTITUTE IN USE.



The significance of this signal is "*I have sighted a British squadron, consisting of 2 Orion class* (G), *2 King George class* (I)."

TO CEASE COMMUNICATION.

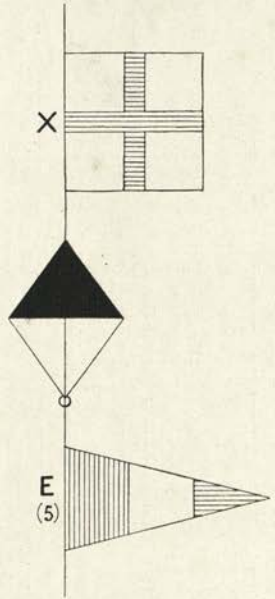
The hauling down of the CONES indicate that F. S. code signalling is completed, and any further signals will be in International Code in the usual manner.

This applies to communications as to latitude and longitude of ships sighted, course, etc., etc., etc

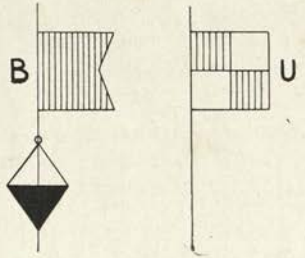
SIGNALS OF SPECIAL SIGNIFICANCE.

Doubt.—(1) Any hoist *at the dip* signifies that the sender is uncertain as to the accuracy of the information that he is imparting.

(2.) If unable to recognise the nationality of the fleet sighted, the sender hoists the special signal provided (**X** cone) with, below it the numeral for ships sighted. (*Single hoist*).



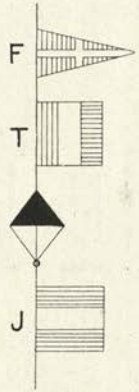
(3.) If able to recognise nationality, but unable to identify any ship or ships, the cone in the first hoist is hoisted *upside down*, and in the second hoist the identification letter or letters of the ship silhouette *most like the unknown vessel.*



First hoist. *Second hoist.*

The significance of this signal is "*I have sighted an unknown British vessel more like the Lion class than any other.*

(4). The special signal for a flotilla of torpedo craft is a **T** immediately following the nationality letter and superior to the cone. For submarines an **S.**



Example: Single hoist only.

The significance of this signal is "*I have sighted a flotilla of 10 French Torpedo boats.*"

SPECIAL SIGNALLING BETWEEN WARSHIPS.

When for any reason warships wish to use this Code between themselves, the JACK is to be hoisted instead of the ENSIGN in conjunction with the CONE for the Preparative.

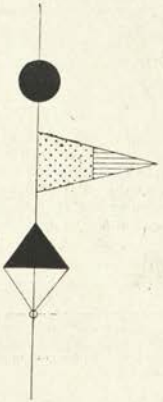
The significance of this signal is that the Service Flags will be used instead of International Code Flags.

The usual service alphabetical flags and numeral pennants will then be used, together with the proper service substitutes when required

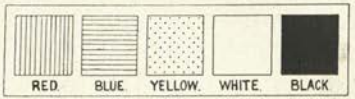
Otherwise the general directions given above to be adhered to.

GENERAL NOTE.

In order to prevent confusion between this and the old system, till 31st December, 1913, every first hoist should begin with a ball, to indicate that the 1913 system is in use. On and after 1st January, 1914, this ball will not be required.



Example: "Answering."



Key to colour symbols used in these illustrations.

LONG DISTANCE SIGNAL SYSTEM.

LONG DISTANCE SYSTEM.

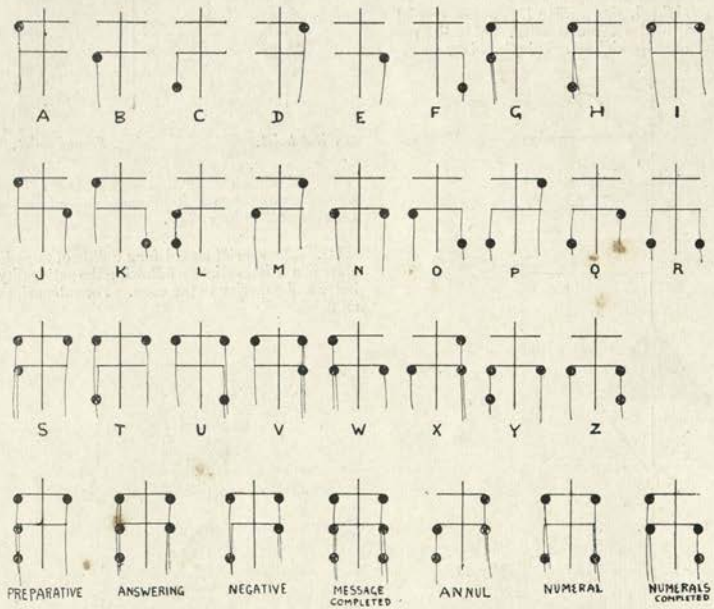
Cones, balls or square flags may be used *indifferently*: significance is entirely a matter of *position.**

There are six positions. These are:

(1.) *In a ship end on*:
1 and 2 ends of topsail yard.
3 and 4 ends of lower yard.
5 and 6 at the dip from lower yard (well clear of the bridge).

(2.) *In a ship broadside on.* The triatic stay takes the place of the topsail yard Positions 3 and 4 about the level of the tops. Positions 5 and 6 just clear of the upper works. (Keep well clear of the masts and rigging).

* This system is based upon the fact that at great distances it is impossible to distinguish with certainty a ball from a cone—hence the absence of significance in objects.



PROCEDURE.

Hoist preparative.—On the answering being made haul down preparative and proceed with the signal, not more than one letter being made at a time.

The alphabet is as per accompanying illustration.

Signals are of course always to be made so that they *are read* as they appear here.

The combination need not be made up of the same object: thus the preparative may be made up of two cones, a square flag and a ball instead of four balls, cones or square flags.

A cone at the *masthead* always has the significance of the cone in the flag signal identification system and denotes nationality signals about to be made. Hauling down this cone indicates that remaining signals do not denote nationality.

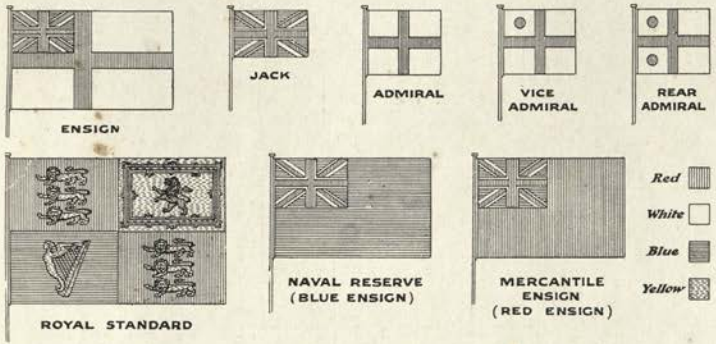
For the cone in the nationality signals, hoist the NUMERAL combination, and NUMERALS COMPLETED when the equivalent of the first hoist is completed.

Pennants are not to be used as objects, but, when the distance is very great or the light poor a long pennant may be flown from the lower yard (or at level with the fore-top) so as more clearly to indicate the positions.

NIGHT SIGNALLING.

Use *red* or *white* lamps with a *green* lamp for the long pennant.

BRITISH FLEET.



ROSYTH

to	knots.
Aberdeen	95
Dover	473
Helder	360
Hull	260
Kronstadt	1345
Newcastle	130
Portsmouth	570
Sheerness	458
Wilhelmshaven	445

SHEERNESS

to	knots.
Dover	45
Dunkirk	70
Helder	190
Hull	200
Kronstadt	1200
Newcastle	328
Portsmouth	150
Wilhelmshaven	270

PORTSMOUTH

to	knots.
Barbadoes	3600
Berehaven	375
Brest	226
Cherbourg	72
Devonport	155
Gibraltar	1200
Lorient	331
New York	3080
Pernambuco	3900
Portland	55
Wilhelmshaven	620

DEVONPORT

to	knots.
Berehaven	375
Brest	140
Cape of Good Hope	5890
Cherbourg	110
Gibraltar	1050
Lorient	233
New York	2905
Portland	100
Queenstown	292
Rochefort	370
Toulon	1764

GIBRALTAR

to	knots.
Ajaccio	1000
Algiers	420
Berehaven	1170
Biserta	875
Brest	953
Devonport	1050
Malta	980
Oran	225
Toulon	713

MALTA

to	knots.
Aden	2320
Ajaccio	450
Biserta	240
Constantinople	702
Port Said	920
Sevastopol	1000
Spezia	580
Suda Bay	575
Suez	1010
Toulon	612

ADEN

to	knots.
Batavia	3950
Beira	2824
Bombay	1652
Cape Town	4450
Colombo	2100
Delagoa Bay	3340
Devonport	4350
Durban	3650
Karachi	1470
Mauritius	2600
Suez	1310
Tamatave	2290
Zanzibar	1770

COLOMBO

to	knots.
Bombay	900
Calcutta	1240
Devonport	6450
Fremantle (W.A.)	3105
Karachi	1400
Penang	1280
Rangoon	1207
Singapore	1600
Sydney (N.S.W.)	5450

SINGAPORE

to	knots.
Bangkok	820
Batavia	500
Devonport	8020
Hong Kong	1430
Manila	1320
Saigon	648

HONG-KONG

to	knots.
Devonport	9450
Kiao-chau	1270
Manila	650
Nagasaki	1067
Port Arthur	1415
Saigon	930
Shanghai	870
Ta-kau (Formosa)	340
Vladivostock	1927
Wei-hai-wei	1470
Yokosuka	1620

CAPE OF GOOD HOPE

to	knots.
Ascension	2395
Durban	812
Falkland Isles	4800
Fremantle (W.A.)	4850
Hobart	5527
Madagascar	1800
Port Elizabeth	428
Portsmouth	5960
St. Helena	1710
Teneriffe	4470

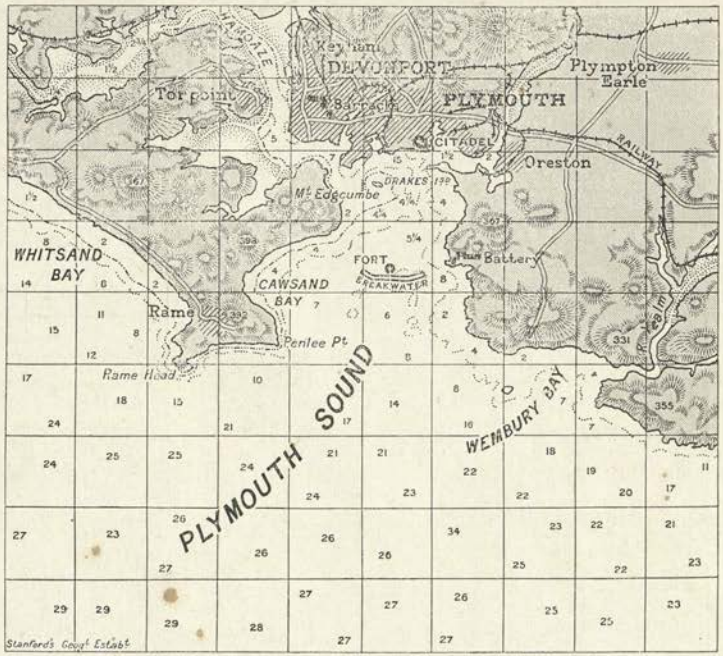
ESQUIMAULT

to	knots.
Honolulu	2410
San Francisco	750
Seattle	76
Yokosuka	4300

SYDNEY (N.S.W.)

to	knots.
Adelaide	1076
Auckland	1280
Batavia	4476
Brisbane	510
Cape of Good Hope	6157
Colombo	5450
Devonport (*via* Cape)	12,047
Hobart	630
Melbourne	570
Singapore	4980
Wellington, (N.Z.)	1234

Royal Dockyards.



(In 2000 yard squares. Soundings in fathoms. Heights in feet.)

1. **DEVONPORT** and **KEYHAM.** At *Devonport*—two big slips, three small. Dry docks:—No. 3, could just take *Duncan* class, size 430 × 93 × 34½ feet, and three others, of which one (Long Dock) can take a second class cruiser; other two suitable for small craft only. At *Keyham*—No slips. New basin, 35½ acres, depth, 32½ft. Tidal basin, 10 acres, depth, 32ft.

Dry Docks in New Extension:—

Entrance lock, 730 × 95 × 44 feet, can take *Dreadnought* and *Inflexible*.
No. 9 (double) 745 × 95 × 32 ,, ,, ,, ,,
,, 10 (double) 741 × 95 × 44 ,, ,, ,, ,,
,, 8 659 × 95 × 32 ,, ,, ,, ,,

In the old part of the yard there are three docks, of which one (Queen's) can take a second class cruiser; the others small craft only. Total employés for the two yards, about 6000.

Admiralty Chart No. 1267. Rise of Spring Tide 15½ feet (Dockyard).

BRITISH DOCKYARD.

(Divided into 2000 yard squares. Soundings in fathoms. Heights in feet.)

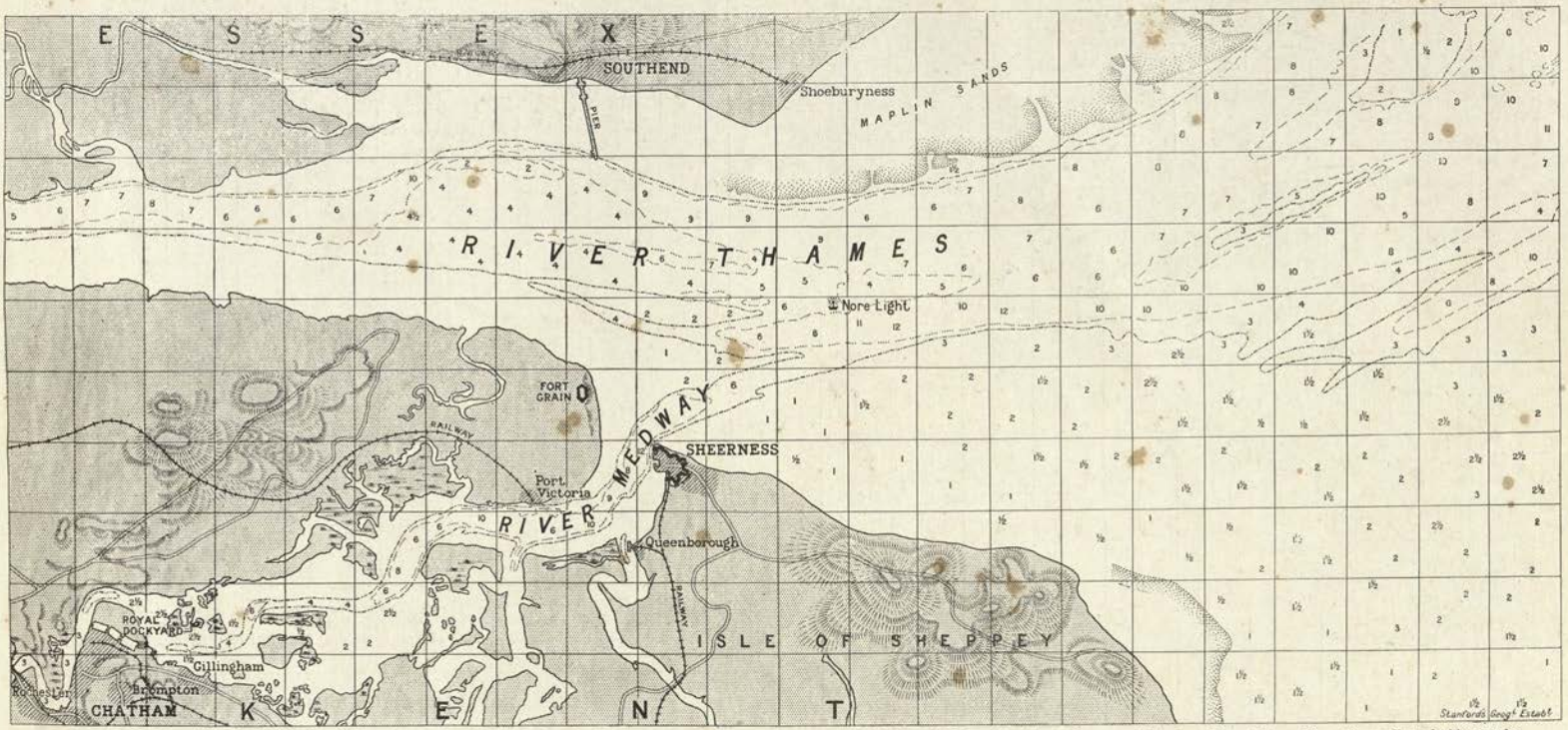
WESTERN ENTRANCE.

EASTERN ENTRANCE.

2. **PORTSMOUTH.** One slip for building battleships or cruisers up to 750 feet.
Three large and one small basins.
Floating dock, 680 × 113 × 36 feet (33,000 tons).
Dry docks:—No. 15, 563 × 94 × 33½ feet.
„ 14, 565 × 82 × 33½ „ (enlarging to 700 × 100).
„ 13, 560 × 82 × 33½ „
„ 12, 485 × 80 × 33½ „
Deep dock, 461 × 82 × 41½ feet.
N. Lock, 466 × 82 × 33½ „
S. Lock, 466 × 82 × 33½ „
and ten smaller docks. Total employés, about 8000 normally.
Admiralty Chart No. 2631-2045. Rise of Spring Tide, 13½ feet (Dockyard).
Note.—Breakwater from Lumps Fort due south about 2 miles.

BRITISH HOME DOCKYARDS.

(In squares of 2000 yards. Soundings in fathoms. Heights in feet).



3. **CHATHAM.** Three building slips. Three large closed basins. Dry docks:—

No. 9,	800 × 100 × 33	feet.
„ 8,	456 × 82 × 33	„
„ 7,	456 × 82 × 32½	„
„ 6,	456 × 80 × 32½	„
„ 5,	460 × 80 × 32½	„

There are four other docks suitable only for small craft (Nos. 1, 2, 3, 4). Total employés, about 6000.

Admiralty Chart No. 1834-1607-1185. Rise of Spring Tide, 18¼ feet.

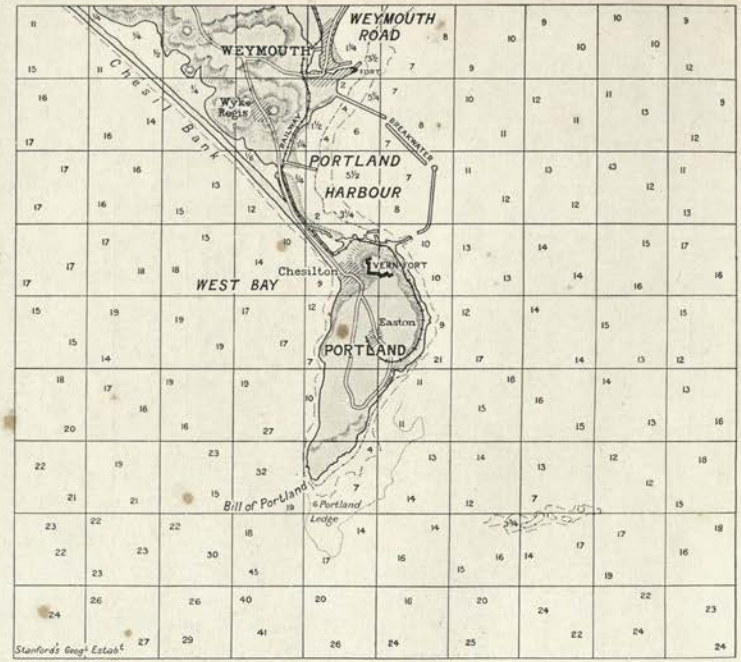
4. **SHEERNESS.** No slips. One small basin. Dry docks:—Five, all small, and able to take small craft only. Destroyer base. Floating dock, 680×113×36 feet (33,000 tons).

Admiralty Chart No. 1833. Rise of Spring Tide 16 feet.

BRITISH NAVAL PORTS AND HARBOURS.

(Divided into 2000 yard squares. Soundings in fathoms. Heights in feet.)

HAULBOWLINE. No slips. Dry docks :—
(*a*) Entrance, size 720 × 94 × 32½ feet.
(*b*) No 1 „ 608 × 94 × 32½ „ (lengthened 1911).
(Admiralty Chart No. 1765. Rise of Spring Tide 11¾ feet.)



PORTLAND. 1500 acres of enclosed harbour; minimum depth, 30 feet. Coaling station. N. and E. entrances 700 feet wide. Strongly fortified.
Admiralty Chart No. 2255. Rise of Spring Tide, 9 feet (Bill of); 6¾ feet (Breakwater).

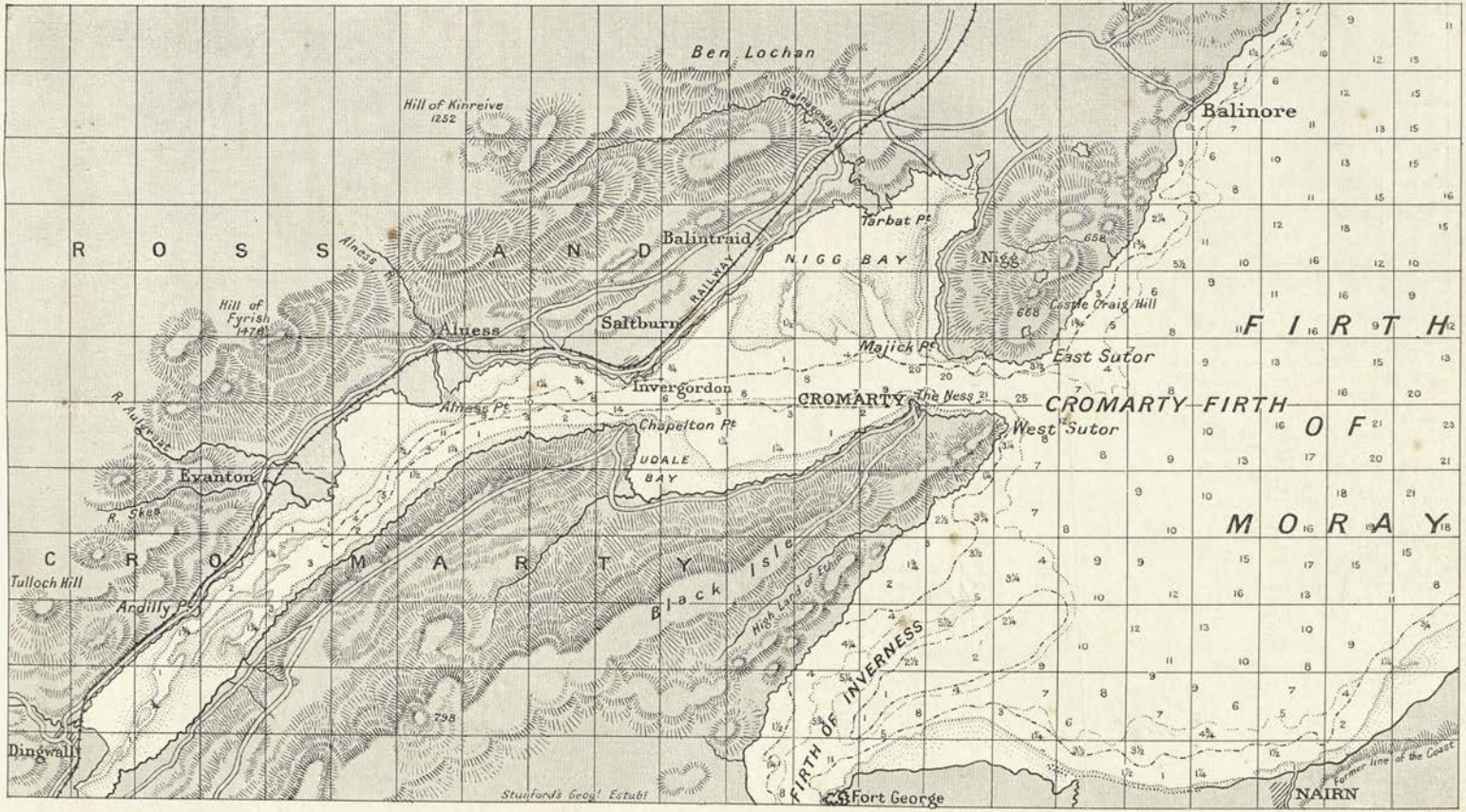
Other Naval Harbours in Home Waters.

BEREHAVEN. Good anchorage.

SCILLY. The anchorage is moderately good. The entrance is very narrow, difficult and dangerous. Fortifications were being erected, but work now stopped.

LOUGH SWILLY. Very moderately fortified. Good anchorage.

KINGSTOWN (Dublin), **TORBAY, FALMOUTH, CROMARTY FIRTH** (Scotland, E. Coast), **SCAPA FLOW,** are other anchorages used by fleets. Only the first has any forts, but Cromarty is being fortified.



CROMARTY FIRTH.

BRITISH DOCKYARDS AND NAVAL HARBOURS.

(All maps divided into 2000 yard squares. Soundings in fathoms. Heights in feet).

ROSYTH (constructing). Two docks 850 × 110 × 36 feet. Entrance locks 850 × 110 × 36 feet.
Admiralty Chart No. 114 B. Rise of Spring Tide, 16½ feet.

MEDITERRANEAN.

MALTA. One small building slip. Dry docks:—

No. 4 (Hamilton), size, 520 × 94 × 35½ feet.
„ 3, (Somerset) „ 468 × 80 × 34 „
„ 2 / „ 1 } combined „ 536½ × 73 × 25 „
„ 7, *(single)* „ 550 × 95 × 35½ „
„ 5-6, *(double)* „ 770 × 95 × 35½ „

Area of war harbour, about 100 acres. *New mole in progress.* New works completed 1908. Well fortified. Good anchorage. Base for Mediterranean Fleet.

Admiralty Chart No. 194. Rise of Spring Tide 2 feet.

GIBRALTAR. *West Harbour*—No slips. Dry docks:—

No. 1 (Prince of Wales), size, 850 × 90 × 35½ feet.
„ 2 (Queen Alexandra) „ 550 × 90 × 35½ „
„ 3 (King Edward) „ 450 × 90 × 35½ „

There is another dock (No. 4) for torpedo craft.

Area of harbour, 450 acres, depth 30 feet at low water. Well fortified—guns mounted 1000 feet above water.

Proposed East Harbour (not yet built). (Projected). No. 1 dry dock, able to take any warship, size 850 × 90 × 36 feet. Area of harbour, 400 acres.

Admiralty Chart No. 144. Rise of Spring Tide, 3¼ feet (New Mole).

PEMBROKE. Building yard. Two large slips. Dry docks:—One, 404 × 75 × 24¾ feet (high water).
Admiralty Chart No. 915-2393.
Rise of Spring Tide, 22½ feet (Dockyard).

DOVER. New harbour, 610 acres; depth of 30 feet at low water over half the area. E. entrance, 1 cable; W. entrance, 800 feet. Coaling station. Well fortified. Submarine base.

Moorings for 16 battleships, 5 large cruisers, 7 *Counties*, 4 small cruisers, and for destroyers.

(The tide at entrance is very strong, making ingress difficult).

Admiralty Chart No. 1698-1828.
Rise of Spring Tide, 18¾ feet.

BRITISH DOCKYARDS AND HARBOURS.

(Divided into 2000 yard squares. Uniform scale. Soundings in fathoms. Heights in feet.).

INDIAN OCEAN.

ADEN. Well fortified. Coaling. Harbour 8×4 miles.

BOMBAY. Harbour 14×5 miles. Dry docks:—(Bombay Trust) 500×65½×28½ feet.

COLOMBO (CEYLON). Fortified Coaling station. Excellent and deep harbour, sheltered by breakwaters. Dry dock: 708 × 85 × 32 feet, able to take any warship.

MAURITIUS (PORT LOUIS). Good harbour, with awkward entrance. Coaling station. Fortified. One dry dock: 384 × 60 × 19½ feet, and one smaller.

PENANG (STRAITS SETTLEMENTS). Good deep harbour. Coaling. Dry dock: 343×46×14½ ft.

SINGAPORE. Coaling station. Good roads. Average anchorage, 10 fathoms. Tanjong Pagar Docks: (1) Victoria, 467 × 65 × 20; (2) Albert, 478 × 60 × 21. Keppel Harbour: (1) 400 × 47 × 16; (2) 450 × 52 × 19; (3) *Building*, to be complete by January, 1913, 846 × 100 × 34, to take any warship.

N.B.—Both PENANG and SINGAPORE are included within the limits of the CHINA Station.

CHINA STATION.

HONG KONG. Repairing yard. No slips. Dry docks:—

Admiralty No. 1, 555 × 95 × 39 feet. New dock: Quarry Bay, (Butterfield & Swire) 750×88×34½ feet.

At Kau-Lung (see map): No. 1, 700 × 86 × 30 feet (lengthened).

Hope Dock, 432½ × 84 × 24 feet.

Cosmopolitan, 466 × 85½ × 20 feet. Also three smaller, able to take torpedo craft, etc.

N.B.—All the above, except the two first, are the property of the Hongkong & Whampoa Dock Co., Ltd.

Area of basin (tidal), 9½ acres (*bldg.*) Average depth of harbour, 40 feet.

Admiralty Chart No. 1180-1459. Rise of Spring Tide, 8 feet

WEI-HAI-WEI (CHINA). Anchorage. Unfortified base. Coaling station.

ESQUIMAULT (British Columbia). Formerly dockyard. Dry dock: 450×65×26½ feet. (Taken over by the Canadian Navy.)

CAPE STATION.

CAPE COAST CASTLE (BRITISH GOLD COAST, W. AFRICA). Fortified coaling station. Anchorage average, 28 feet.

PORT STANLEY (FALKLAND IS.) Good deep harbour. Fortified coaling station.

ST. HELENA. Fortified coaling station. 10-fathom harbour.

SIERRA LEONE (W. AFRICA). Fortified coaling station. Anchorage, 6-16 fathoms.

SIMON'S BAY (CAPE OF GOOD HOPE). New dock, to take any warship, 750 × 95 × 30 feet. Tidal basin, 28 acres, 30 feet deep. Fortified moderately.

There is a dock at Capetown, 500 × 66 × 24½ feet, and a floating one at Durban, 425 × 70 × 23 feet.

N. AMERICA AND WEST INDIES.

BERMUDA. Fortified. Large floating dock, 545 × 100 × 33 feet (*Dreadnought*, 17,500 tons). Shallow harbour.

BRIDGETOWN (BARBADOS). Coaling. Open roadstead. There is a small dock here, able to take vessels drawing up to 14 feet.

HALIFAX (Nova Scotia). Formerly Dockyard. Coaling station. Anchorage average, 13 fathoms. Dry dock: 572 × 89 × 29 feet (*Dreadnought*).

ST. JOHN'S (NEWFOUNDLAND). There is a private dock here, 569½ × 85 × 24 feet.

AUSTRALIAN STATION.

ADELAIDE (S. AUSTRALIA). Commercial harbour, 7 miles from the town. Dry dock: 500 × 60 × 26 feet, *projected*.

AUCKLAND (NEW ZEALAND). Coaling station. Excellent harbour; average 40 feet deep. Dry dock (Calliope): 521 × 80 × 33 feet (*Cressy*). Also one smaller, able to take torpedo craft.

BRISBANE (QUEENSLAND, AUSTRALIA). 25 miles up river. Navigable for ships drawing 20 feet. Coaling station. Dry dock: 431½ × 55 × 19 feet.

HOBART (TASMANIA). Coaling station. Anchorage average, 10 fathoms.

KING GEORGE SOUND (W. AUSTRALIA). Coaling station. Fortified.

SYDNEY (N.S.W., AUSTRALIA). Fortified coaling station and base. Harbour excellent. Bar 27 feet at low water. Dry docks: (Sutherland) 638 × 84 × 32 feet (*Dreadnought*), (Fitzroy) 477 × 59 × 21½ feet. *Woolwich* dock (private), 675 × 83 × 28 feet, and four smaller.

MELBOURNE. Commercial harbour. One dry dock: 470 × 80 × 27 feet, and three smaller. Port Phillip has an area of 800 square miles.

BRITISH COMMERCIAL HARBOURS AND IMPORTANT SHIPBUILDING FIRMS.

British Private Docks, at Home and Abroad, able to take Dreadnoughts.

HEBBURN (Graving), ...	size, 700 × 90 × 28½	feet.	
BRISTOL (Avonmouth)	„ 855 ×100 × 34	„	
SOUTHAMPTON (No. 5)	„ 745 × 91 × 32½	h.w.	
„ (No. 6)	„ 860 × 90 × 33	feet.	
LIVERPOOL (Canada Graving)	„ 925 × 94 × 32	„	
„ (Brocklebank Graving) ...	„ 804 × 96 × 32	„	
BIRKENHEAD (No. 6)	„ 730 × 85 × 30	„	
„ (No. 7)	„ 880 × 95 × 33	„	
RENFREW (*pro.* complete in 1916) ..	„ 1020 ×100 × 36	„	
BELFAST (New Graving)	„ 750 × 96 × 32½	„	
COLOMBO (Dry dock)	„ 708 × 85 × 32	„	
HALIFAX (N.S.) Graving	„ 572 × 89 × 29	„	

Principal Commercial Harbours.

(In order of importance, with approximate tons of shipping clearing annually).

London (9 million); Liverpool (7 million); Cardiff (6¾ million); Newcastle and district (4½ million); Hull (2¼ million); Glasgow (2 million); Southampton (1½ million); and Newport, Blyth, Swansea, Sunderland, Leith, Dover, Kirkcaldy, Grimsby, Middlesbrough, Grangemouth (all doing about 1 million); Harwich, Manchester, Bristol, Goole, Hartlepool, Belfast, and Folkestone (all doing from ¾ to ¼ million).

Mercantile Marine.

About 37,000 vessels (about 10,750,000 tons steamers and about 2,700,000 tons sailing).

Personnel: About 260,000 (about 43,000 are Lascars, &c., and 40,000 of other foreign nationalities).

Private Yards which Build Warships.

Arranged alphabetically. All details supplied by the firms concerned. The names in heavy type are those by which the firms in question are generally described.

Armstrong (*see* Elswick).

Beardmore (Wm. Beardmore & Co., Ltd.) Naval Construction Works, Dalmuir, nr. Glasgow. Six big slips, four smaller. Employees *circa* 10,000. This yard is designed for vessels up to 900 ft. long. 200-ton crane. Fitting basin 28 ft. at low water.

Cammell-Laird (Cammell, Laird & Co., Ltd., Birkenhead and Tranmere). Six big slips, five small slips. Three medium docks able to take County class at a pinch; two small. Two large docks and a Wet Basin capable of taking Dreadnoughts and battle-cruisers. Employees 8000.

Clydebank (John Brown & Co., Ltd.) Nine big slips. Employees 9000-10,000.

Denny (Denny & Co., Dumbarton.) Destroyers, Torpedo boats, etc.

Doxford (William Doxford & Sons, Ltd., Sunderland). Builders of vessels up to 20,000 tons deadweight. Also Reciprocating, Turbine and Diesel Marine Engines up to any size. Also special Self-discharging Colliers and bunkering craft. Output over 100,000 tons gross per annum.

Earle (Earle's Shipbuilding & Engineering Co., Ltd., Hull).

Elswick (Sir W. G. Armstrong, Whitworth & Co., Ltd., Newcastle-on-tyne). *Elswick Yard.*—Water frontage 770 yards. Main machinery shop 1000 ft. long. Three big slips, six others. Machinery 2500 h.p. A 150-ton hydraulic crane, 100-ton sheerlegs, etc. Floating workshop. No docks; but prior claim to the Hebburn battleship dock.

High Walker Yard. (Five miles lower down than Elswick). 70 acres. Frontage about a mile. Eight slips, 1000 to 500 ft. long.

Low Walker Yard. Area 30 acres. Frontage 317 yards. Six slips from 650 to 450 ft. long. Total employees including ordnance and steel works, about 25,000.

Fairfield (The Fairfield Shipbuilding and Engineering Co., Ltd., Glasgow). Area 70 acres. Water front 2600 feet. 11 slips. Dock: six acres with 270 ft. entrance. 250 ton crane. Employees 8500. Output in 1913, 33,200 tons; 202,200 H.P.

Hanna Donald (Hanna Donald & Wilson, Paisley). Destroyers, etc.

Harland & Wolff, Ltd. (Belfast). Six big slips, three smaller. There are two large docks (850×100×42½ ft. and 825×80×26 ft.) and three small docks in the district. Big liners are constructed here, the only Government work being machinery. Employees, 15,000. Also at Glasgow (Govan). Six big slips. Engineering and repairing works, Bootle, Liverpool; and Southampton.

Hawthorn-Leslie (R. & W. Hawthorn, Leslie & Co., Ltd., Hebburn). Nine slips up to 700 ft. long. Employees 3000. One dock, 460×68×21 ft. on blocks; 26 ft draught at quay at low water. Engine department of 150,000 I.H.P. per annum. Build destroyers.

Inglis (A. & J. Inglis, Ltd., Pointhouse Shipyard, Glasgow). Destroyers, etc.

London & Glasgow (London & Glasgow Engineering & Iron Shipbuilding Co., Ltd.) Govan. Three big slips, three smaller. Employees 3000.

Palmer (Palmer's Shipbuilding & Engineering Co., Ltd., Hebburn and Jarrow-on-Tyne). Fourteen slips. Employees 9000. Has two docks, Hebburn and Jarrow, 700×90×29 ft; 440×70×18 ft.; also patent slipway (Jarrow)—all used for warships.

Scott (Scott's Shipbuilding & Engineering Co., Ltd., Greenock). Slips for six large and four small vessels; fitting-out basin, 540×172 ft., equipped with 120-ton electric jib crane on one side, and a 80 ton electric travelling crane on the other; the depth of water at lowest Spring tides is 28 ft. Graving dock 369 ft. long × 48 ft. at the top, and 42 ft. at the bottom. Men employed: shipyard, 2000 to 3000; engine works, 1500 to 2000.

Swan-Hunter (Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne). Seventeen building berths, eleven berths with overhead electric canes. Four berths covered in. Employees about 7000. Annual gross shipbuilding capacity, 150,000 tons.

The dry docks dept. include a large repairing yard with 2 graving docks and two floating docks. Engine works have developed the "Neptune-Diesel" engines. Total area of works 78 acres. Water frontage, 4000 ft. Allied firms are the Wallsend Slipway & Engine Co., Ltd. Wallsend: Barclay, Curle & Co., Ltd., of Whiteinch, Govan, Elderslie and Glasgow.

Thornycroft (John I. Thornycroft & Co., Ltd., Woolston, Southampton). Torpedo boats, destroyers, light cruisers, mine layers, etc., up to 3500 tons. Machinery output for 1913 was 110,500 H.P. Employees 3500-3250. Opposite Southampton Docks.

Vickers (Vickers Ltd., Barrow-in-.urness). Six big slips, 18 smaller slips. Docks: one depositing dock 240 ft. long, capable of lifting vessels of 2000 tons, available at all states of the tide. There is a graving dock in the town 500×60×22 ft. Employees, including ordnance works, etc., *circa* 16,000.

White (J. Samuel White & Co., Ltd., Cowes). Torpedo boats and destroyers of largest types. Seven building berths. Engine works for reciprocating and turbine engines of highest powers. Also Diesel engines. New hammer-head 80 ton crane. Employees 1800.

Yarrow (Yarrow & Co., Ltd., Scotstown, Glasgow). Destroyer and boiler works.

Other Private Firms in the British Isles.

Shipbuilders.

ABDELA, Isaac J. & Mitchell, Ltd., Queen's Ferry, Chester.
AILSA Shipbuilding Co., Ltd., Troon and Ayr.
ALLEY & McLellan, Ltd., Polmadie.
ARDROSSAN Dry Dock and Shipbuilding Co., Ltd., Troon and Ayr
AUSTIN, S. P. & Sons, Ltd., Sunderland.
BAIRD Bros., North Shields.
BARCLAY CURLE & Co., Ltd., Whiteinch, Glasgow.
BARTRAM & Sons, Ltd., Sunderland.
BEACHING Bros., Ltd., Great Yarmouth.
BLUMER, John & Co., Sunderland.
BLYTH Shipbuilding and Dry Docks Co., Ltd., Blyth.
BOW, M'Lachlan & Co., Paisley.
BROWN, George & Co., Greenock.
CAIRD & Co., Ltd., Greenock, N.B.
CALEDON Shipbuilding and Engineering Co., Ltd., Dundee.
CAMPBELTOWN Shipbuilding Co., Campbeltown.
CAMPER & NICHOLSON, Ltd., Gosport.
CHALMERS, W. & Co., Ltd., Rutherglen, Glasgow.
CHAMBERS, J., Lowestoft.
CLYDE Shipbuilding and Engineering Co., Ltd., Port Glasgow.
COCHRANE & Sons, Ltd., Selby.
CONNELL, Charles & Co., Ltd., Scotstoun.
COOK, Welton & Gemmell, Ltd., Beverley.
COX & Co., Engineers, Ltd., Falmouth.
CRABTREE & Co., Ltd., Great Yarmouth.
CRAIG, Taylor & Co., Ltd., Stockton-on-Tees.
CRAN, J. & Co., Leith.
CROWN, John & Sons, Ltd., Sunderland.
DIXON, Sir Raylton & Co., Ltd., Middlesborough-on-Tees.
DOBSON, William & Co., Newcastle-on-Tyne.
DUBLIN Dockyard Co., Ltd. Dublin.
DUNCAN, R. & Co., Ltd., Port Glasgow.
DUNDEE Shipbuilding Co., Ltd., Dundee.
DUNLOP, Bremner & Co., Ltd., Port Glasgow.
DUTHIE Torry Shipbuilding Co., Aberdeen.
EDWARDS & Co., Ltd., Milwall.
ELTRINGHAM, Jos. T. & Co., South Shields.
FAY, J. G. & Co., Ltd., Southampton.
FELLOWS & Co., Ltd., Southdown Dry Docks, Great Yarmouth.
FERGUSON Bros., Port Glasgow.
FIFE, W. & Sons, Fairlie.
FINCH, E. & Co., Ltd., Chepstow.
FLEMING & Ferguson, Ltd., Paisley.
FORBES & Birnie, Peterhead.
FULLERTON, J. & Co., Paisley.
GOOLE Shipbuilding & Repairing Co., Ltd., and Associated Firm, The Dundee Shipbuilding Co., Ltd., Dundee.
GRAY, W. & Co., Ltd., West Hartlepool.
GREENOCK & Grangemouth Dockyard Co., Ltd., Greenock and Grangemouth.
HALL, A. & Co., Ltd., Aberdeen.
HALL, Russell & Co., Ltd., Aberdeen.
HAMILTON, William & Co., Ltd., Port Glasgow.
HARKESS, W. & Sons, Ltd., Middlesbrough.
HAWTHORNS & Co., Ltd., Leith.
HENDERSON, D. & W. & Co., Ltd., Partick, Glasgow.
HEPPLE & Co., Ltd., South Shields.
IRVINE'S Shipbuilding & Dry Docks Co., Ltd., Hartlepool.
LAING, Sir James & Sons, Ltd., Sunderland.
LARNE Shipbuilding Co., Larne Harbour.
LOBNITZ & Co., Ltd., Renfrew.
LYTHAM Shipbuilding & Engineering Co., Lytham, Lancs.
McALLISTER, R. & Sons, Dumbarton.
MacCOLL & Thomson, Ltd., Govan.
MacCOLL, Ltd., Abercorn Basin, Belfast.
McGREGOR & Sons, Kirkintilloch.
MACKAY Bros., Alloa.
MACKIE & Thomson, Ltd., Govan.
McMILLAN, A. & Sons, Ltd., Dumbarton.
MENZIES & Co., Leith.
MERSEY Engineering Works Co., Ltd., Liverpool.
MONTROSE Shipbuilding Co., Ltd., Montrose.
MUNRO, A., Ardrishaig.
MURDOCH & Murray, Ltd., Port Glasgow.
NAPIER & Miller, Ltd., Old Kilpatrick.
NORTH OF IRELAND Co., Londonderry.
NORTHUMBERLAND Shipbuilding Co., Ltd., Howdon-on-Tyne.
OSBOURNE Graham & Co., Ltd., Sunderland.
PHILIP & Son, Ltd., Dartmouth.
PICKERSGILL, Wm. & Sons, Ltd., Sunderland.
PIMBLOTT, I. & Sons, Ltd., Northwich.
PRIESTMAN, J. & Co., Sunderland.
RAMAGE & Ferguson, Leith.
READHEAD, J. & Sons, Ltd., South Shields.
RENNIE FORRESTT Shipbuilding, Engineering and Dry Dock Co., Ltd., Wivenhoe, Essex.
RENNOLDSON, J. P. & Sons, South Shields.
RICHARDSON, Duck & Co., Ltd., Stockton-on-Tees.
RITCHIE, Graham & Milne, Whiteinch, Glasgow.
ROBERTSON, A. & Co., Sandbank, Argyllshire.
ROBERTSON, A. W. & Co., Canning Town.
ROPNER & Sons, Ltd., Stockton-on-Tees.
RUSSELL & Co., Port Glasgow.
SCARR, Henry, Hessle.
SCARR, Joseph & Son, Beverley.
SCOTT & Sons, Bowling, nr. Glasgow.
SHORT Bros., Ltd., Sunderland.
SHRUBSALL, H., E. Greenwich.
SIMONS, Wm. & Co., Ltd., Renfrew.
SIMPSON, Strickland & Co., Ltd., Dartmouth.
SMITH'S Dock Co., Ltd., Middlesbrough-on-Tees.
STEPHEN, A. & Son, Ltd., Govan.
SUNDERLAND Shipbuilding Co., Ltd., Sunderland.
THOMAS, W. & Sons, Amlwich, N. Wales.
THOMPSON, J. L. & Sons, Ltd., Sunderland.
THOMPSON, R. & Sons, Ltd., Sunderland.
TYNE Iron Shipbuilding Co., Ltd., Willington-Quay-on-Tyne.
WALKER, C. H. & Co., Ltd., Sudbrook, nr. Chepstow, Mon.
WALKER, R. C., Grimsby.
WARREN, W. H., New Holland, Lincs.
WHITE, Wm. & Sons, Cowes, I.W.
WILLIAMSON, R. & Sons, Workington.
WILLOUGHBY Bros., Ltd., Plymouth.
WOOD, Skinner & Co., Ltd., Newcastle-on-Tyne.
WORKMAN, Clark & Co., Ltd., Belfast.
YARWOOD, W. J. & Sons, Castle Dock, Northwich, Cheshire.

Marine Engine Builders.

ABERNETHY, J. & Co., Aberdeen.
AITCHISON, Blair & Co., Clydebank.
AMOS & Smith, Ltd., Hull.
BLAIR & Co., Ltd., Stockton-on-Tees.
CAMPBELL & Calderwood, Paisley.
CENTRAL Marine Engine Works, West Hartlepool.
CLARK, G., Ltd., Sunderland.
COOPER & Greig, Dundee.
DICKINSON, J. & Sons, Ltd., Sunderland.
DUNSMUIR & Jackson, Ltd., Govan.
ELLIOTT & Garrood, Ltd., Beccles.
FISHERS, Ltd., Paisley.
GAUDLIE, Gillespie & Co., Glasgow.
GREY, G. T., South Shields.
HOLMES, C. D. & Co., Ltd., Hull.
HOSKING, T., Jr., Ltd., London.
KINCAID, J. G. & Co., Ltd., Greenock.
LIDGERWOOD, W. V. V., Speedwell Ironworks, Coatbridge.
McCOLL & Pollock, Ltd., Sunderland.
McKIE & Baxter, Glasgow.
MILLER & Macfie, Ltd., Glasgow.
MUIR & Houston, Ltd., Glasgow.
NORTH-EASTERN Marine Engineering Co., Ltd., Wallsend-on-Tyne and Sunderland.
PARSON'S Marine Steam Turbine Co., Ltd., Wallsend.
PLENTY & Son, Ltd., Newbury.
RANKIN & Blackmore, Greenock.
RICHARDSONS, WESTGARTH & Co., Ltd., Hartlepool.
RITCHIE, J., Partick.
ROSS & Duncan, Glasgow.
ROWAN, D. & Co., Glasgow.
SHIELDS Engineering and Dry Dock Co., Ltd., North Shields.
SISSON, W. & Co., Ltd., Gloucester.
VAUXHALL and West Hydraulic Engineering Co., Ltd., Luton, Bedford
WALLSEND Slipway and Engineering Co., Ltd., Wallsend.

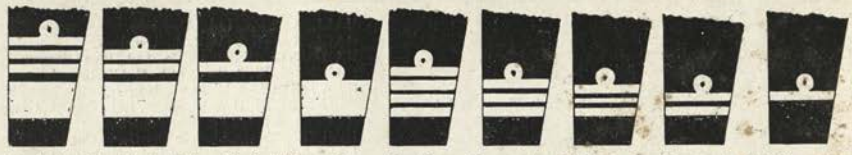
109542

BRITISH PERSONNEL, GUNS AND TORPEDOES.

Personnel: About 136,500 and 28,000 Fleet Reserve, and about 30,000 R. N. R. and R. N. Volunteers.

Colour of ships: Dark grey all over; destroyers, black, except in hot climates.

Uniforms.



Admiral | Vice-Admiral | Rear-Admiral | Commodore | Captain | Commander | Lieutenant (over 8 years) | Lieutenant (under 8 years) | Sub-Lieutenant

Admiral of the fleet one stripe more than a full Admiral.
In relative ranks, Engineers have the same *without the curl*, and with purple between the stripes.
" " Doctors " " " " red " "
" " Paymasters " " " " white " "
" " Naval Instructors " " " " blue " "
Engineer officers have executive titles.

Torpedoes.

	Name or Mark.	Air Pressure.	Charge.	*Max.* Range.	Average Speed if set for 1000	2000	4000	7000	11000
inch.			lbs.	yds.	kts.	kts.	kts.	kts.	kts.
21	Whitehead	...	...	11000	...	...	...	45	30
21	Service ("*Hardcastle*")	...	...	7000	...	...	...	...	...
18	R.G.F. New	...	...	...	46	...	...	...	...
18	Model '04 "Fiume III"	2150	205	4000	33	27	19	..	...
18	3 cylinder R.G.F., Mark V*	2000	205	4000	31	26	18	...	...
18	3 cylinder R.G.F., Mark V	1700	205	2000	26	24		...	...

Gunnery Notes.

15 inch in new ships.
13·5 inch, 45 cal. in *Orion, Lion* and later ships.
12 inch, 50 cal. in *St. Vincent, Neptune, Colossus,* and *Indefatigable* classes.
12 inch, 40 cal. in *King Edward, Formidable, London, Duncan, Queen* classes.
12 inch, 45 cal. in *Lord Nelson, Dreadnought, Invincible, Téméraire* classes.
12 inch, 35 cal. in *Majestic* and *Canopus* classes.
9·2 inch, 50 cal. in *Minotaur* and *Lord Nelson* classes.
9·2 inch, 45 cal. in *Drake, King Edward, Black Prince* and *Warrior* classes.
9·2 inch, 40 cal. in *Cressy* class.

Naval Guns.

Notation.	Calibre.	Mark.	Length in calibres.	Weight of gun.	Weight of A.P. projectile.	Initial velocity.	*Maximum* penetration with A.P. capped at K.C. 5000	* 3000	Danger space for average ship at 10,000 yards.	5000 yards.	3000 yards.	Average rate of fire. Rounds per minute.
	inch.			tons.	lbs.	f.s.	inches.	inches.	yards.	yards.	yards.	
...	13·5	later	45	...	1400	...	...	...	...	...	...	...
A^7	13·5	II.*(P)	45	80	1250		22	26				
A^6	12	XII	50				19	24	160	600	900	
A^5	12	XI.	45	58	850	2900 (M.D.)	$17\frac{1}{2}$	22				1
A^4	12	IX.	40	50	850	2750 (M.D.)	16	20	150	540	800	1
AAA	12	VIII.	35	46	850	2367 (C.)	$14\frac{1}{2}$	$14\frac{1}{2}$	150	390	620	1
AAA	10	new	45	$32\frac{1}{2}$	500	2800 (M.D.)	$11\frac{1}{2}$	$14\frac{1}{2}$	150	480	720	1
B	10	old	32	29	500	2040 (C.)	$5\frac{1}{2}$	$7\frac{1}{4}$	90	270	540	·6
AAA	9·2	XI.	50	30	380	2800 (M.D.)	10	13				
AA	9·2	IX. & X.	45	27	380	2640 (C.)	$8\frac{1}{2}$	$11\frac{1}{2}$	147	420	630	2·3
A	9·2	VIII.	40	25	380	2347 (C.)	$6\frac{1}{2}$	$9\frac{1}{4}$	111	360	600	2·3
A	7·5	II.	50	16	200	2800 (M.D.)	$6\frac{1}{2}$	$9\frac{1}{4}$	105	420	600	2·3
B	7·5	I.	45	14	200	2600 (C.)	$5\frac{1}{4}$	$7\frac{1}{2}$				2·3
D	6	IX. & X.	50	$7\frac{1}{2}$	100	2800 (M.D.)	4	$5\frac{1}{2}$	75	250	475	7
E	6	VII.-VIII.	45	$7\frac{1}{2}$	100	2535 (C.)	3	$4\frac{1}{2}$	66	210	435	7
F	6	wire	40	7	100	2200 (C.)			37	150	360	8
F	4·7	wire	40	2	40	2188 (C.)			...	...	...	
F	4	M'06										
F	4	wire	40	$1\frac{1}{2}$	25	2300 (C.)			...	...	...	
F	4	M'07	...	...	25	— (M.D.)			...	...	...	

(P) Previously known as "12 inch A."

AC Raven *(diving school)*

AQ Argus, etc. *(coastguard cruisers)*

AH Adamant *class* (2).

AI Maidstone.

AJ Enchantress *(Admiralty yacht)*.

AK Gunboats *(gunnery training)*

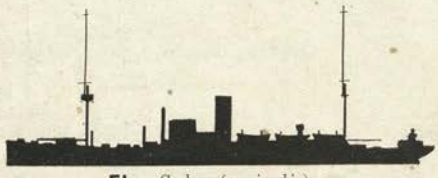
CG Bramble *class* (4

CH Forth & Thames *(submarine depôts)*

DH Majestic *class (page 57) (vary in details)* (twin funnels.)

EG Tyne *(t.b.d. depôt)*

EH Assistance *(repair ship)*

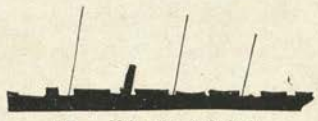


EI Cyclops *(repair ship)*

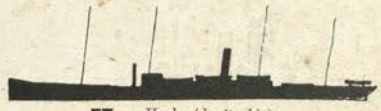
EJ Aquarius *(distillery ship)*

FN Odin *class*

FO Petroleum, etc. *(oil ships)*



FP Maine *(hospital ship)*



FZ Hecla *(depôt ship)*

G Orion *class* (4 ships) (*page* 36).

H Colossus *class* (2 ships) (*page* 37).

I Iron Duke (4 ships) & King George V *classes* (4 ships) (*pages* 34 & 35).

J Dreadnought (*page* 41).

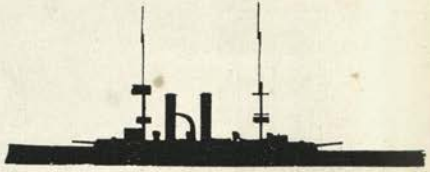
K Neptune (*page* 38).

L St. Vincent & Téméraire *classes* (*pages* 39 and 40).

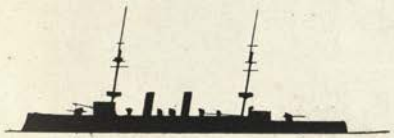
GH Lord Nelson *class* (2 ships) (*page* 46).

GI King Edward *class* (*page* 47) (first 5 ships).

GJ Queen, Duncan, London, Formidable & Canopus *classes* (*pages* 49 to 53.)



HG Swiftsure *class* (*page* 48) (2 ships).



HI Eclipse *class* (*page* 74) (8 ships) also

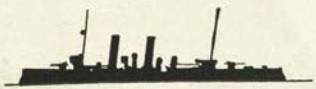
HI Eclipse *class* (*page* 74) (1 ship—*Talbot*).
(Note different funnels and hull as compared to Blake, and rig as compared to Crescent).

HJ Astraea *class* (*page* 75) (8 ships).
(Compare with Edgars—mistakes easy).

HK Vulcan

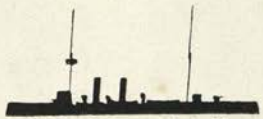
HL Edgar *class* (*page* 63) (6 ships).
(Funnels in this class vary in thickness).

IG Crescent *class* (*page* 63) (2 ships).
(Note the high forecastle in comparison with the Edgars).



JG Apollo *class* (*page* 75) (11 ships).

JH Pelorus *class* (*page* 73) (11 ships).



JK Philomel (*page* 75).

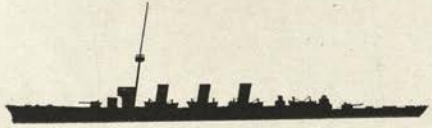
JL Blake & Blenheim.

KH Torpedo gunboats (*minelayers, etc.*)
Seagull. Sharpshooter.

Halcyon *class.* **KH** Torpedo gunboats. Alarm *class* Gossamer *class.*

LN Leander (*t.b.d. depôt*).

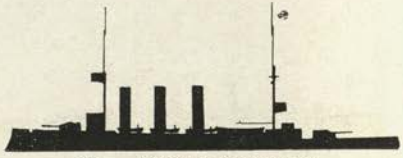
NA P. F. & S. light cruisers *class* (6) (*page* 70)



ND Arethusa *class* (*page* 64).

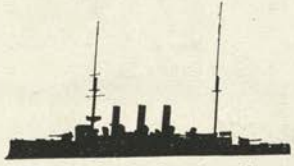
P Indefatigable (*page* 44).

Q Invincible *class* (3 ships) (*page* 45).



QG Monmouth *class* (*page* 59).

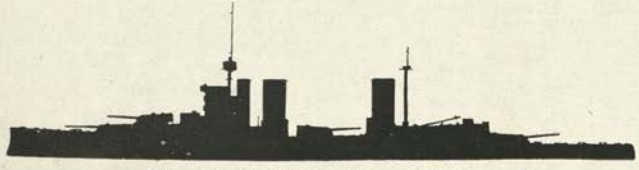
RG Challenger and Highflyer *classes* (*page* 72).



RH Arrogant *class* (*page* 72).

RI Gem *class* (*page* 73).

RJ Speedy

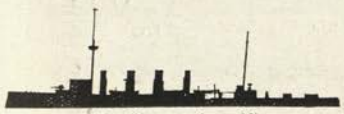


U Lion & Queen Mary *classes* (4 ships) (*page* 43).

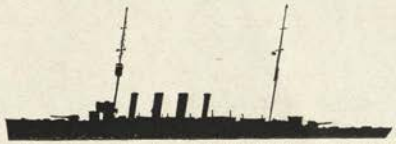
FOUR FUNNELS. ONE MAST.

SA Adventure *class* (*page* 70).

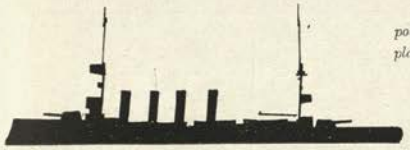
SB Bellona & Blanche *class* (*page* 67).



SB Boadicea (*page* 68).

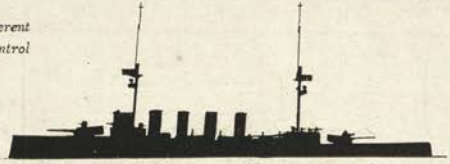


SI Town *class* (*pages* 65, 66, 67) (Vary in details).

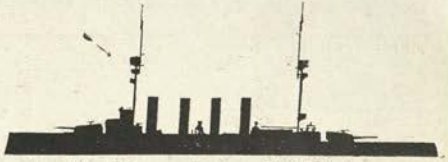


TG Devonshire *class* (*page* 58) (6 ships).

Note in these, different positions of fire control platforms.



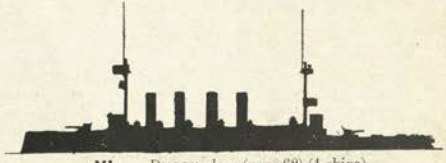
TH Duke of Edinburgh *class* (*page* 57) (2 ships).



TI Warrior *class* (*page* 56) (4 ships).
(Slight differences in all 4.)

VG Drake *class* (*page* 60) (4 ships).
(Note.—Only Drake is without afterbridge).
Details per ship differ.

VH Cressy *class* (*page* 61) (6 ships).
(Funnels closer than in Drake class).



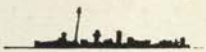
VL Diadem *class* (*page* 62) (4 ships).
(Distinguished from Cressy class by absence of big guns forward and aft

VJ Minotaur *class* (3 ships) (*page* 55).

BRITISH TORPEDO CRAFT. IDENTIFICATION AND SIGNAL SILHOUETTES. *(Copyright).*

TWO FUNNELS.

I "I" *class* t. b. d.



NO Modern t. b.

E "E" *class* t. b. d

E "E" *class* t. b. d.

D "D" *class* t. b. d.

A "A" *class* t. b. d.

ON Older t. b.

THREE FUNNELS.

H Acorn "H" *class.*

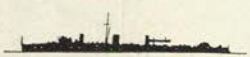
F Ocean "F" *class* t.b.d.

C "C" *class* t. b. d. d.

K Acasta "K" *class.*

S Swift t.b.d.

G "G" *class.*

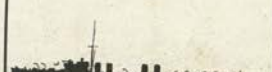


A "A" *class* t. b. d.

FOUR FUNNELS.

F "F" *class.*

F Older "F" *class* t. b. d.



E "E" *class* t. b. d.

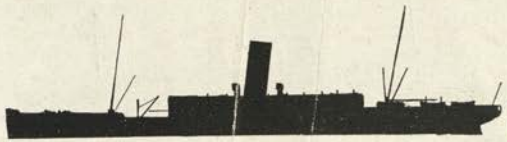
B "B" *class* t. b. d.

A "A" *class* 27 knot t. b. d.

F Viking, Ocean "F" *class* t.b.d.

ONE FUNNEL.

A (2) Orontes and Omrah (Orient). (18 kts.)



F (2) Victorian and Virginian (Allan Line). (18 kts.)

B Laurentic and Meganic (18 kts.)

TWO FUNNELS. TWO MASTS.

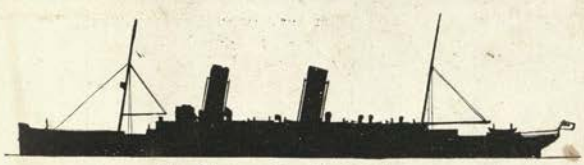
C (5) Macedonia *class* (P. & O.) (18·5 kts.)

D Persia, Arabia, Egypt, China, India (P. & O.) (18 kts.)

E Ophir (Orient Line). (18 kts.)

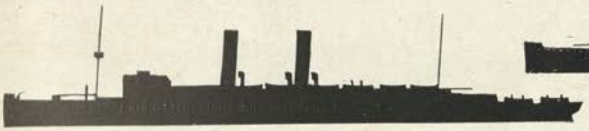
G Empress of Britain (C.P.R.) (20 kts.)

H Majestic (White Star). (20 kts.)



I Campania (Cunard). (22 kts.)

J (2) Caronia and Carmania (Cunard). (18 kts.)



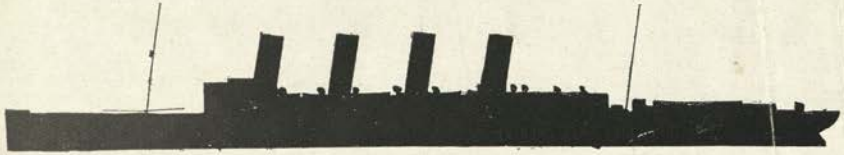
L Franconia and Laconia (20 kts.)

M Royal George and Royal Edward (18 kts.

P Teutonic (White Star), (19 kts.)

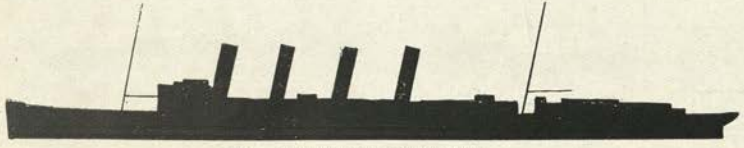
N Oceanic (White Star), (21 kts.)

O Adriatic (White Star), (18 kts.)



Y Olympic (21 kts.)

Z (2) Empress of Asia and Empress of Russia.



W Lusitania (Cunard), (25 kts.)

X Mauretania (Cunard), (25 kts.)

1914 BRITISH DREADNOUGHTS. Nos. 41, 40, 39, 38, 37

(Royal Soverfign Class—5 Ships.)

ROYAL SOVEREIGN (building), ROYAL OAK (building), RESOLUTION (building), RAMILLIES (building), REVENGE (building).

Normal displacement, 25,750 tons. Complement, ——.

Length (*waterline*), feet. Beam, feet. *Mean* draught, feet. Length *over all*, feet (*p.p.* feet).

Guns:
8 *or* 10—15 inch
12—6 inch
—4 inch Anti-aerial
Torpedo tubes (21 inch):
4 *submerged*

Armour:
13½″ Belt (amidships) ... *aaaa*
″ Belt (ends) .....
″ Deck .....
14″ Turrets ..... *aaaa*
″ Secondary Battery ...

1914 Estimates.

1 *Queen Elizabeth* class (*Agincourt*).
3 *Royal Sovereigns* class (*Renown, Repulse, Resistance.*)

4 light cruisers.
12 destroyers.
Some submarines.

Of the above, *Agincourt* is to be built at Portsmouth; *Resistance*, Devonport; *Renown*, Fairfield; *Repulse*, Palmer.

Machinery: Turbine (Parsons). Boilers: (see *Notes*). 4 screws. Designed H.P. 31,000 = 21 kts.
Coal: *normal*, tons; *maximum*, tons. Also oil (1000 tons).

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials:*— 30 *hrs.*	8 *hrs.*	*Boilers*	*Best recent speed*
R. Sovereign	PortsmouthY.	...	Jan.'14	*Dec.'15*			Babcock	
Royal Oak	Devonport Y.	...	Jan.'14	*Dec.'15*			Yarrow	
Resolution	Palmer	Palmer	Nov.'13	*'16*			Yarrow	
Ramillies	Beardmore	Beardmore	Nov.'13	*'16*			Babcock	
Revenge	Vickers	Vickers	'14	*'16*			Babcock	

General Notes.—Belong to the 1913-14 Estimates.

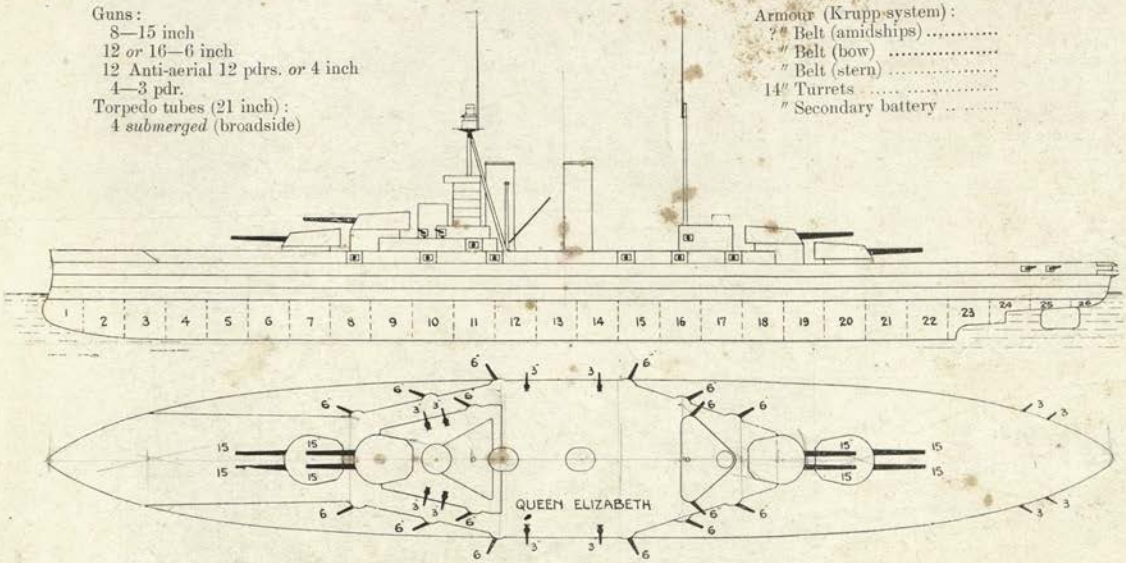
QUEEN ELIZABETH (Oct., 1913), **WARSPITE** (Nov., 1913), *VALIANT* (1914), *BARHAM* (1914), *MALAYA* (1914), and another *pro.* (1914 Estimates).

Displacement *about* 27,500 tons.

Length (*waterline*), 650 feet. Beam, 94 feet. *Mean* draught, 27½ feet. Length *over all*, 650 feet (*p.p.* 625 feet).

Guns:
8—15 inch
12 *or* 16—6 inch
12 Anti-aerial 12 pdrs. *or* 4 inch
4—3 pdr.
Torpedo tubes (21 inch):
4 *submerged* (broadside)

Armour (Krupp system):
?" Belt (amidships) .....
" Belt (bow) .....
" Belt (stern) .....
14" Turrets .....
" Secondary battery .....



Machinery: Parsons Turbine. Boilers: (see *Notes.*) Designed H.P. 58,000=25 kts. Fuel: only oil, *about* 4000 tons.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Trials.*	*Boilers.*	*Best recent speed.*
Queen Elizabeth	Portsmouth	Wallsend	Oct. '12	Oct. '14		Babcock	
Warspite	Devonport	Hawthorn	Oct. '12	Oct. '14		Yarrow	
Valiant	Clydebank	Clydebank	Feb. '13	Feb '15		Babcock	
Barham	Fairfield	Fairfield	Jan. '13	Feb. '15		Yarrow	
Malaya	Elswick	Wallsend	Oct. '13	'15		Babcock	

Note.—Belong to the 1912-13 estimates. *Malaya*, extra ship, gift of Federated Malay States. These ships are heavily armoured against aerial attack, with special protection to funnel tops. Estimated cost average, £2,500,000 per ship = £90 per ton.

1912 BRITISH DREADNOUGHTS. Nos. 31, 30, 29, 28

(Iron Duke Class).

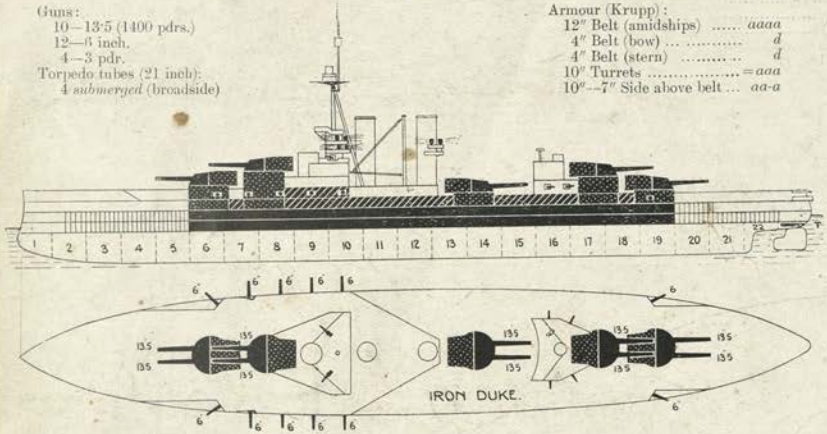
BENBOW (Nov., 1913), **EMPEROR OF INDIA** (*ex Delhi*) (Nov., 1913),
IRON DUKE (Oct., 1912), **MARLBOROUGH** (Nov., 1912).

Normal displacement, 25,000 tons. *Full load*, 26,400 tons.

Length (*waterline*), 620 feet. Beam, 89½ feet. *Mean* draught, 27½ feet. Length *over all*, 620 feet (*p.p.* 575 feet).

Guns:
10—13·5 (1400 pdrs.)
12—6 inch.
4—3 pdr.
Torpedo tubes (21 inch):
4 *submerged* (broadside)

Armour (Krupp):
12″ Belt (amidships) ..... *aaaa*
4″ Belt (bow) ... . *d*
4″ Belt (stern) .... *d*
10″ Turrets ..... = *aaa*
10″—7″ Side above belt ... *aa-a*



Machinery: Turbine (Parsons). Boilers: (see *Notes.*) Designed H.P. 30,000 = 21 kts. Coal: *normal*, 1000 tons; maximum, 2700 tons. Also oil (1000 tons).

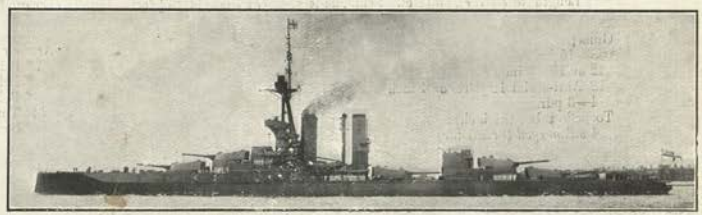
Gunnery Notes.—Extra store of special sensitive H.E. shell.

Armour Notes.—Special protection against aerial attack, crowns to magazines, etc.

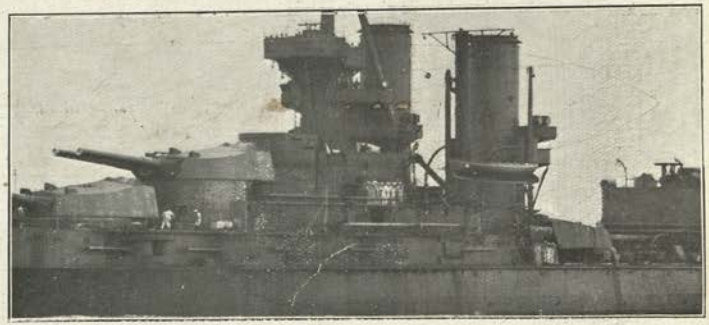
Torpedo Notes.—Submarine telephones fitted.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Trials.*	*Boilers.*	*Best recent speed.*
Benbow	Beardmore	Beardmore	May '12	June '14		Babcock	
E. of India	Vickers	Vickers	May '13	May '14		Yarrow	
Iron Duke	Portsmouth Y	Laird	Jan.'12	Jan.'14		Babcock	
Marlborough	Devonport Y	Hawthorn	Jan.'12	Jan.'14		Yarrow	

Note.—Belong to the 1911-12 Estimates.



Iron Duke.



Iron Duke.

1911 BRITISH DREADNOUGHTS. Nos. 26, 25, 24, 23

(King George Class.)

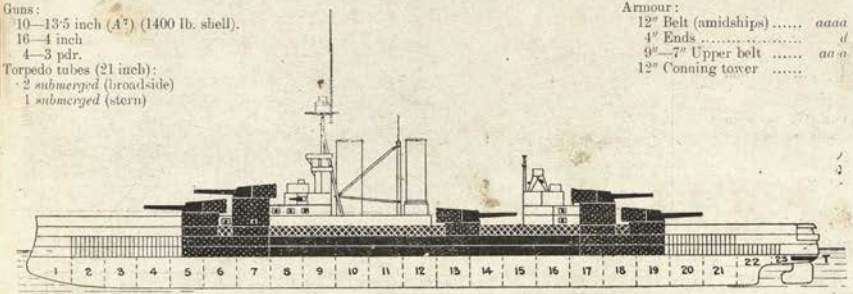
KING GEORGE V (Oct., 1911), **CENTURION** (Nov., 1911), **AJAX** (March, 1912), **AUDACIOUS** (Sept., 1912).

Normal displacement, 23,000 tons. *Full load, about* 25,000 tons. Complement, 900.

Length *over all*, 596 feet. Beam, 89 feet. *Mean* draught, 27½ feet. Length (*p.p.*), 555 feet.

Guns:
10—13·5 inch (A[7]) (1400 lb. shell).
16—4 inch
4—3 pdr.
Torpedo tubes (21 inch):
2 *submerged* (broadside)
1 *submerged* (stern)

Armour:
12″ Belt (amidships) ..... *aaaa*
4″ Ends ..... *d*
9″—7″ Upper belt ..... *aa·a*
12″ Conning tower .....


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
4 4 4

1909 BRITISH DREADNOUGHTS (21 kts.) Nos. 20, 19, 18, 17

(Orion Class—4 Ships.)

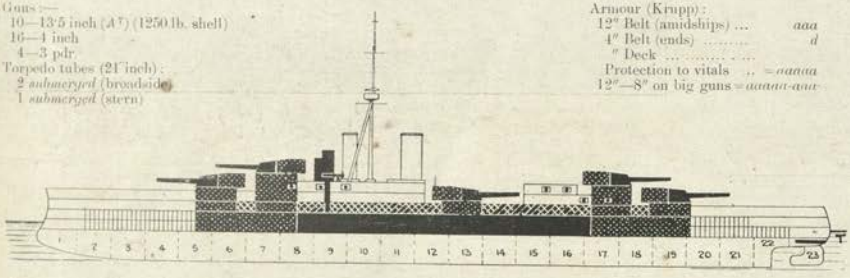
ORION (Aug., 1910). **THUNDERER** (Jan., 1911), **MONARCH** (March, 1911), **CONQUEROR** (May, 1911).

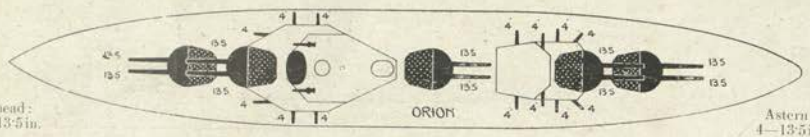
Normal displacement, 22,500 tons. Complement, 900.

Length (*p.p.*), 541½ feet. Beam, 85 feet. *Mean* draught, 27¾ feet. Length *over all*, 584 feet.

Guns:—
10—13·5 inch (*A*⁵) (1250 lb. shell)
16—4 inch
4—3 pdr.
Torpedo tubes (21 inch):
2 *submerged* (broadside)
1 *submerged* (stern)

Armour (Krupp):
12" Belt (amidships) ... *aaa*
4" Belt (ends) ..... *d*
" Deck ....
Protection to vitals ... =*aaaaa*
12"—8" on big guns =*aaaaa-aaa*





Ahead: 4—13·5 in.

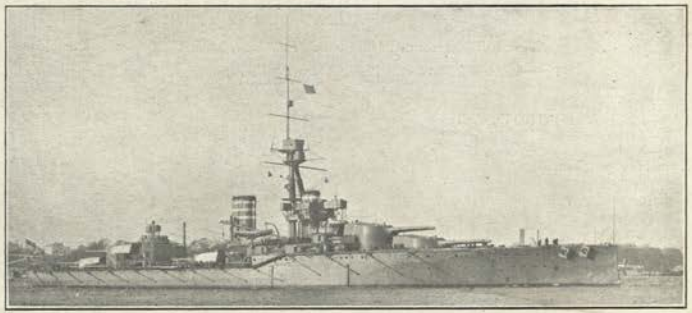
Astern: 4—13·5 in.

Broadside: 10—13·5 inch.

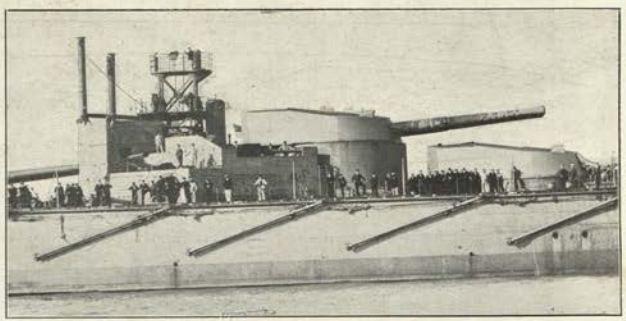
Machinery: Parsons turbine. Designed H.P. 27,000 = 21 kts. 4 screws. Boilers: (see *Notes*).
Coal: *normal*, 900 tons; *maximum*, 2700 tons + oil (1000 tons).
Torpedo Notes.—Bullivant net defence to *Thunderer*.

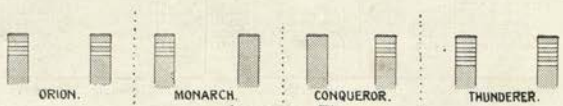
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials:—* *30 hrs.*	*8 hrs. full power (mean)*	*Boilers*	*Best recent speed*
Orion	Portsmouth Y.	Wallsend	Nov.'09	Jan.'12	18,966=19·5	29,108=21·02	Babcock	22·3
Conqueror	Beardmore	Beardmore	Apl.'10	1912	19,100=19·5	28,400=22·13	Babcock	23·1
Thunderer	Thames I.W.	Thames I.W.	Apl.'10	1912	18,927=18·8	27,416=20·8	Babcock	21·45
Monarch	Elswick	Hawthorn	Ap.'10	Ap.'12	19,128=	28,555=21·88	Yarrow	...

General Notes.—*Orion* belongs to the 1909-10 normal estimates; the others are ships which were known as "Conditional *Dreadnoughts*" in the same estimates. In these ships protection is given to the boats for the first time. On her first cruise the *Orion* in the Bay of Biscay rolled 21°. This rolling was attributed to her small bilge keels, 6 feet only. During 1912 improved bilge keels were fitted and the ships roll far less. On trials *Conqueror* made a *maximum* of over 23 kts. *Monarch* was originally named *King George V*.



Thunderer. *Photo, Abrahams & Sons*





(Colossus Class—2 Ships).

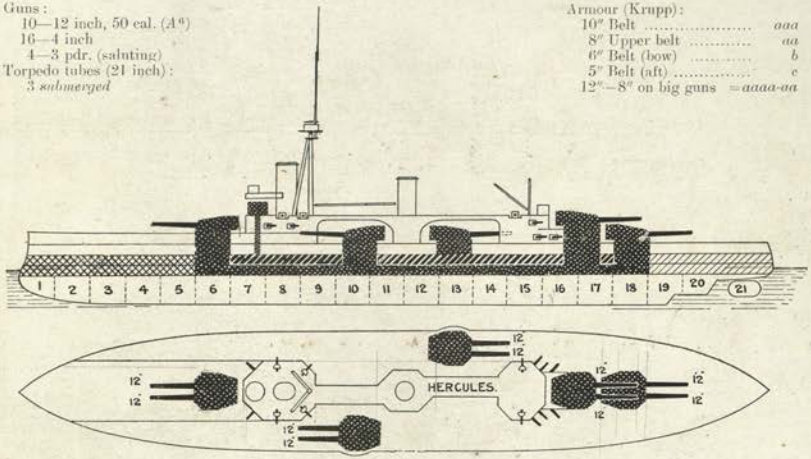
COLOSSUS (April, 1910) & **HERCULES** (May, 1910).

Normal displacement, 20,000 tons. Complement, 900.

Length (*waterline*), 540 feet. Beam, 86 feet. Draught (*normal*), 27 feet. Length *over all*, 546 feet.

Guns:
10—12 inch, 50 cal. (A^{α})
16—4 inch
4—3 pdr. (saluting)
Torpedo tubes (21 inch):
3 *submerged*

Armour (Krupp):
10″ Belt ..... *aaa*
8″ Upper belt ..... *aa*
6″ Belt (bow) ..... *b*
5″ Belt (aft) ..... *c*
12″–8″ on big guns = *aaaa-aa*

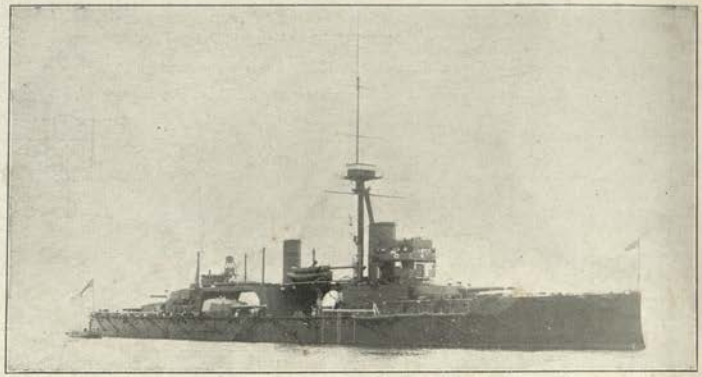


Machinery: Parsons turbine. Designed H.P. 25,000 = 21 kts. Boilers: Yarrow and Babcock. Coal: *normal*, 900 tons; *maximum*, 2,700 tons. Also oil fuel.

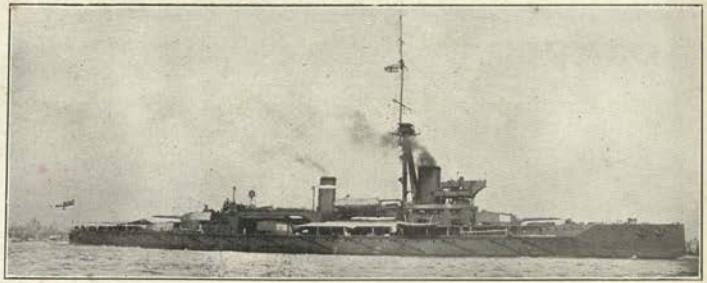
Armour Notes.—Upper deck armoured against aero-craft.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*		*Boilers*	*Best recent speed*
Colossus	Scott S.& E. Co.	Scott	July, '09	July '11	18,000 = 19·6	23,000 = 21·5	18 Babcock	
Hercules	Palmer	Palmer	Aug., '09	Aug. '11	18,000 = 19·6	28,700 = 21·5	Yarrow	

General Notes.—These ships are practically sisters to the *Neptune*, differing mainly in disposition of anti torpedo armaments, and slightly increased beam. They belong to the normal 1909-10 estimates, and were laid down earlier than is usually the case. Average cost, £1,730,000 = *about* £87 per ton.



Colossus *Photo, Symonds.*



Hercules. *Photo, Symonds.*

FUNNEL MARKINGS AS ALTERED LATE IN 1912.

COLOSSUS. HERCULES.

1909 BRITISH DREADNOUGHT (21 kts.) No. 12

NEPTUNE (Sept., 1909).

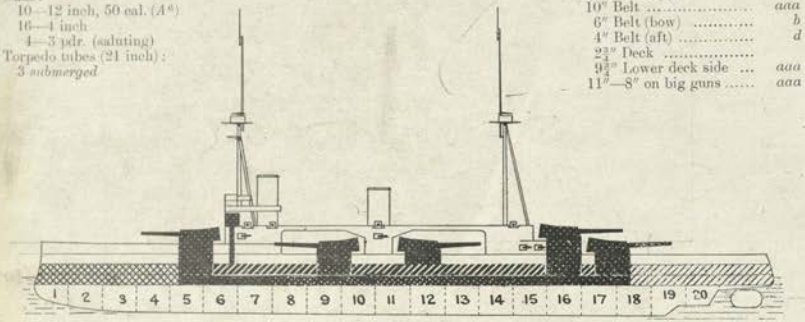
Normal displacement, 19,900 tons. Complement, 900.

Length (*waterline*), 510 feet. Beam, 85 feet. Draught (*normal*), 27 feet. Length *over all*, 546 feet (*p.p.* 510 feet).

Guns:
10—12 inch, 50 cal. (A^6)
16—4 inch
4—3 pdr. (saluting)
Torpedo tubes (21 inch):
3 *submerged*

Armour (Krupp):

10" Belt	*aaa*
6" Belt (bow)	*b*
4" Belt (aft)	*d*
2½" Deck	
9¾" Lower deck side	*aaa*
11"—8" on big guns	*aaa*



Ahead: 6—12 in.

Astern: 8—12 in.

Broadside: 10—12 inch.

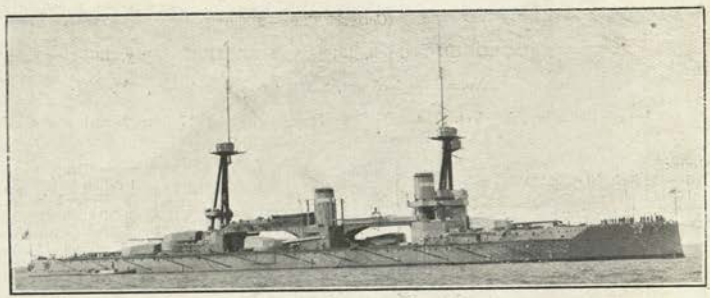
Machinery: Parsons turbine. Designed H.P. 25,000=21 kts. (more expected). Boilers: Yarrow. Coal: *normal* 900 tons; *maximum* 2700 tons. Also oil fuel: 450 tons.

Armour Notes.—Upper deck and magazines armoured against aero-craft.

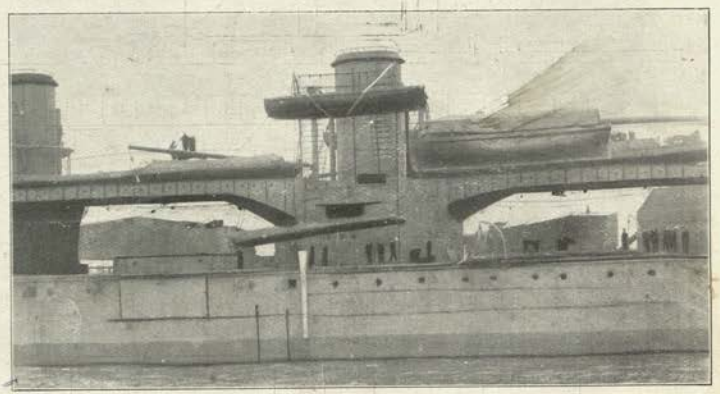
Engineering Notes.—Consumption on trial was 1·46 lbs. per h.p. at full power. Turbines: L.P. rotor diameter, 82 inch; L.P. rotor diameter, 109 inch. R.P.M. 352. Boiler pressure: 235 lbs. per square inch. Heating surface: 63,630 square feet. Total weight of machinery with auxiliaries: 1109 tons + water to working level, 2936½ tons. Engine room complement: 251.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*First Trials*		*Boilers*	*Best recent speed*
Neptune	Portsmouth	Clydebank	Jan. '09	Jan. '11	18,373=19	27,721=21·78	Yarrow	22·7

General Note.—Belongs to the 1908-09 estimates. Cost to build, £86·8 per ton. Cost of machinery, £258,000. Solid bulkheads abandoned in this ship. Fore funnel heightened 1912.



Photo, Symonds.



NEPTUNE

(St. Vincent Class—3 Ships).

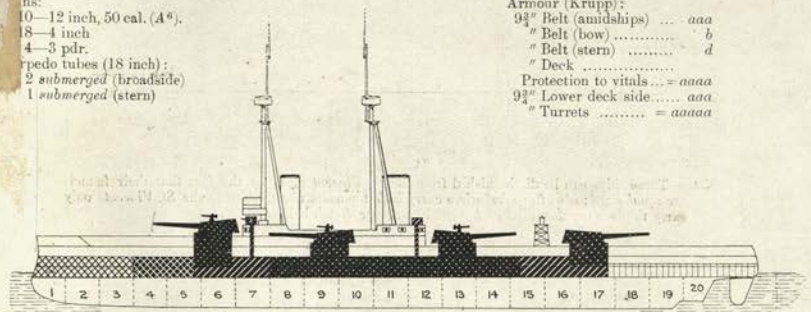
ST. VINCENT (Sept., 1908), **COLLINGWOOD** (Nov., 1908), & **VANGUARD** (March, 1909).

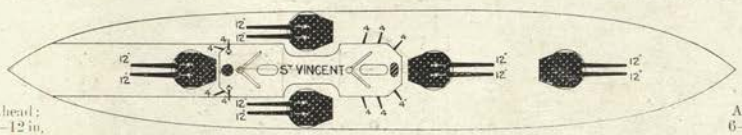
Normal displacement, 19,250 tons. Complement, 670.

Length (*waterline*), 530 feet. Beam, 84 feet. *Maximum* draught, feet. Length *over all*, 536 feet.

ns:
10—12 inch, 50 cal. (*A*[6]).
18—4 inch
4—3 pdr.
rpedo tubes (18 inch):
2 *submerged* (broadside)
1 *submerged* (stern)

Armour (Krupp):
9¾″ Belt (amidships) ... *aaa*
″ Belt (bow) ..... *b*
″ Belt (stern) ..... *d*
″ Deck .....
Protection to vitals ... = *aaaa*
9¾″ Lower deck side..... *aaa*
″ Turrets ..... = *aaaaa*





Ahead:
6—12 in.

Astern:
6—12 in.

Broadside: 8—12 in.

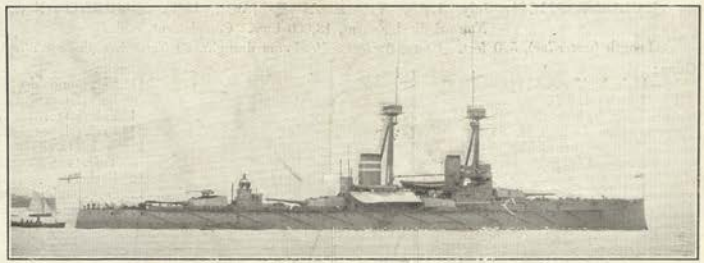
Machinery: Parsons turbine (as *Dreadnought*). 4 screws. Boilers: Yarrow or Babcock. Designed H.P. 24,500 = 21 kts. Coal: *normal*, 900 tons; *maximum*, 2,700 tons Also oil fuel.

Gunnery Notes.—4 inch on top of forward turret removed 1911.

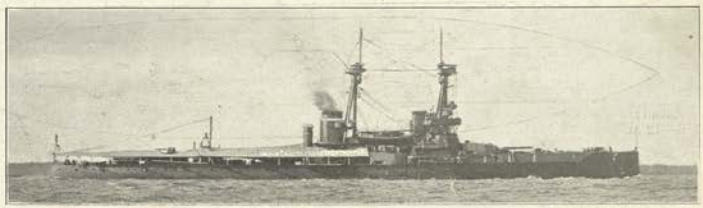
Engineering Notes.—H.P. rotor diameter, 68 inch. L.P. rotor diameter, 92 inch. 324 R.P.M. Pressure: 235 lbs. Heating surface: 63,414 square feet. Weight of main and auxiliary engines: 1072½ tons + water to working level = 1983½ tons. Average consumption on trials: 1·8 lbs. per H.P.

Name.	*Builder.*	*Machinery and Boilers by.*	*Laid down.*	*Completed.*	*Last refit*	*Trials.*	*Boilers.*	*Best recent speed.*
St. Vincent	Portsmouth	Scott Eng. & S. Co.	Dec. '07	Jan., '10		=21·9	Babcock	22·5
Collingwood	Devonport	Hawthorn L.	Feb.'08	Jan., '10		26,319=21·5	Yarrow	22
Vanguard	Vickers	Vickers	April'08	Feb., '10		=22·1	Babcock	22·4

General Notes.—Estimates 1907-08. These ships are simply enlarged *Téméraires* (see *Dreadnought*).



St. Vincent. *Photo, Symonds & Co.*



Collingwood. *Photo, Symonds & Co.*

Note.—To be distinguished from *Téméraire* class by the fact that the after funnel is *conspicuously* larger than the fore funnel. The *St. Vincent's* are also noticeably *longer*. (See also next page.)

1907 BRITISH DREADNOUGHTS (20-21 knots). Nos. 7, 6, 5

(Téméraire Class—3 Ships).

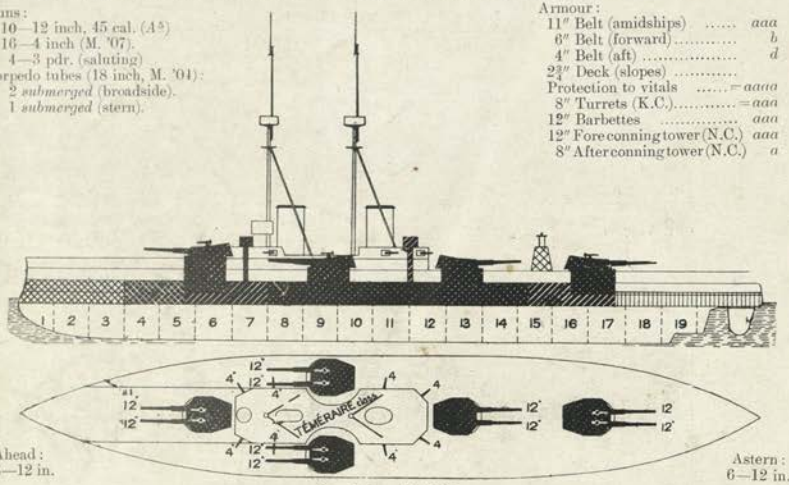
BELLEROPHON (July, 1907), **TÉMÉRAIRE** (Aug., 1907), **SUPERB** (Nov., 1907).

Normal displacement, 18,600 tons. Complement, 850.

Length (*waterline*), 520 feet. Beam, 82 feet. *Maximum* draught, 29 feet. Length *over all*, 526 feet.

Guns:
10—12 inch, 45 cal. (A^5)
16—4 inch (M. '07).
4—3 pdr. (saluting)
Torpedo tubes (18 inch, M. '04):
2 *submerged* (broadside).
1 *submerged* (stern).

Armour:
11″ Belt (amidships) ..... *aaa*
6″ Belt (forward)..... *b*
4″ Belt (aft) ..... *d*
2½″ Deck (slopes) .....
Protection to vitals .....=*aaaa*
8″ Turrets (K.C.).....=*aaa*
12″ Barbettes ..... *aaa*
12″ Fore conning tower (N.C.) *aaa*
8″ After conning tower (N.C.) *a*



Ahead: 6—12 in.

Astern: 6—12 in.

Broadside: 8—12 in.

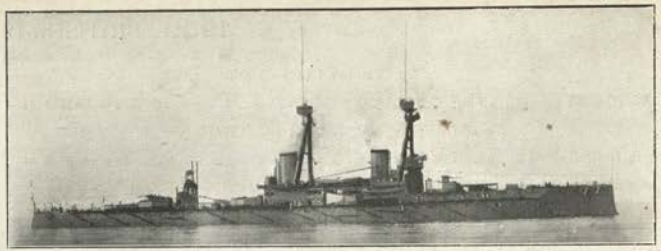
Machinery: Parsons turbine. 4 screws. Details as *Dreadnought*. Boilers: 18 Babcock or Yarrow. Designed H.P. 23,000=20·75 kts. Coal: *normal* 900 tons; *maximum* 2000 tons and oil fuel.

Armour Notes.—Crowns of magazines armoured against aerial attack.

Engineering Notes.—H.P. rotor diameter, 68 inch. L.P. rotor diameter, 92 inch. 324 R.P.M. Pressure: 235 lbs. Heating surface: 55,530 square feet. Weight of main and auxiliary engines: 1014½ tons. Water to working level, total weight=about 1936 tons. Trial consumption averaged 1·55 lbs.

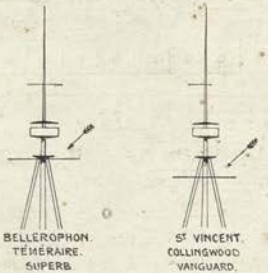
Name.	*Built at.*	*Machinery by.*	*Laid down.*	*Completed.*	*Trials. 8 hrs.*	*Boilers.*	*Best recent speed.*
Bellerophon	Portsmouth	Fairfield	Dec., '06	Feb., '09	24,100=21·9	Babcock	22·1
Téméraire	Devonport	Hawthorn Leslie	Jan., '07	May, '09		Yarrow	22·7
Superb	Elswick	Wallsend Co.	Feb., '07	June, '09		Babcock	21·6

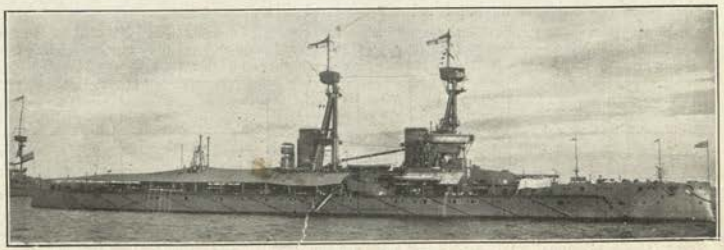
General Notes.—Estimates 1906-07. Average cost of machinery, about £285,000. *Bellerophon* fitted with enlarged bilgekeels, November, 1912. Bullivant net defence to *Superb*.



Photo, Symonds.

Note.—These ships can be distinguished from the *St. Vincent* class by the fact that their funnels are *equal sized*; also the *Téméraires* carry *both* topmasts abaft, whereas the *St. Vincents* only carry the fore topmast abaft. Also end on as per sketch below.





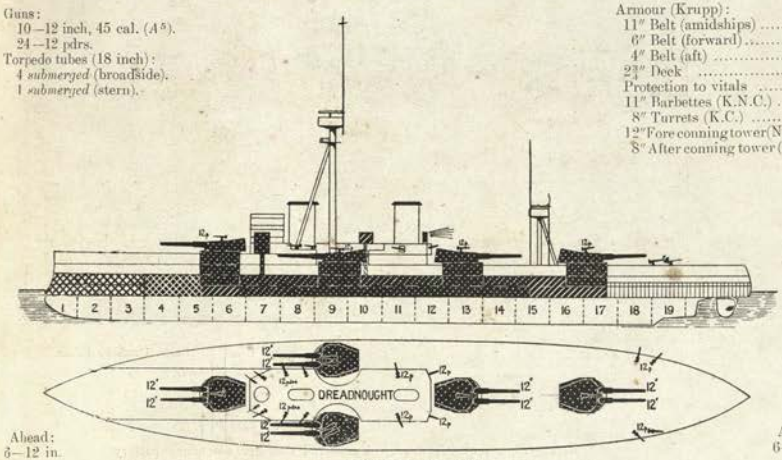
Bellerophon (1914). *Photo, Symonds.*

DREADNOUGHT (February, 1906).

Normal displacement, 17,900 tons. *Full load*, 22,200 tons. Complement, 800.
Length *(waterline)*, 520 feet. Beam, 82 feet. *Maximum* draught, 31 feet. Length *over all*, 526 feet.

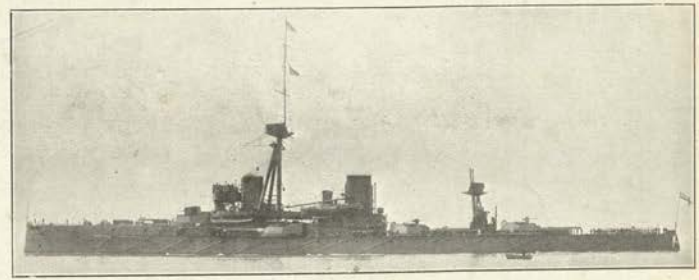
Guns:
10—12 inch, 45 cal. (A^5).
24—12 pdrs.
Torpedo tubes (18 inch):
4 *submerged* (broadside).
1 *submerged* (stern).

Armour (Krupp):
11″ Belt (amidships) ..... *aaa*
6″ Belt (forward) ..... *b*
4″ Belt (aft) ..... *d*
2½″ Deck .....
Protection to vitals ..... = *aaaa*
11″ Barbettes (K.N.C.) ..... *aaa*
8″ Turrets (K.C.) ..... = *aaa*
12″ Fore conning tower (N.C.) *aaa*
8″ After conning tower (N.C.) *a*



Ahead: 6—12 in.
Astern: 6—12 in.

Broadside: 8—12 in.



DREADNOUGHT. (Plain funnels). *Photo, Symonds.*

Machinery: Parsons' Turbine. 4 screws. Boilers: 18 Babcock and Wilcox in 3 groups. Designed H.P. 23,000 = 21 kts. Coal: *normal* 900 tons; *maximum* 2000 tons, also oil fuel.
Nominal radius: 5800 at economical speed; 3500 at 18·5 kts. (excluding oil).
Torpedo Notes.—Nearly all round net defence (upper deck level) and much internal protection. Claimed to be nearly torpedo proof. 1904 model torpedoes. 13 searchlights.
Engineering Notes.—Full power, 400 revolutions. One H.P. ahead, one H.P. astern turbine on each wing shaft; inner shafts, 3 turbines each (cruising L.P. ahead; L.P. astern). 1 astern turbine on each. Boiler pressure, 250 lbs., reduced slightly at the turbines. Each turbine has 39,600 blades. Main condensers 26,000 square feet, auxiliary 6000. Grate surface 1599 square feet. Heating surface 55,400 square feet. On trials she exceeded her speed for short spurts (best mile at 21·78), but barely averaged it on her eight hours' run. Very free from vibration. Weight of machinery, main and auxiliary, 973¼ tons + water = 1897¾ tons.
Coal consumption: Very economical at full speed, about 17½ tons an hour for full power. At slow speed consumption is heavy. At 5000 H.P. (13 kts.) it averages nearly 5½ tons an hour. At 10,000 H.P. about 11 tons per hour.

Name.	*Built at*	*Machinery by*	*Laid down*	*Completed*	*Last refit*	*Trials.* 30 hrs. at 16,350.	8 hrs. full.	*Boilers.*	*Best recent speed*
Dreadnought	Portsmouth	Vickers	Dec.,'05	Oct.,'06	'11	16,330=19·3	24,712=21·02	Babcock	22·4

General Notes.—Freeboard forward, 28 feet. Cost £1,797,497. Estimates 1905-06. In this ship the officers' quarters are forward, crew aft. The ship is very steady, and consequently extremely wet and uncomfortable. She is a remarkably steady gun platform. Draws 2 feet more than the designed (29 ft.), with normal coal. She was very hastily built. All material used is extremely strong. Tactical diameter, extreme helm: 865 yards at 19 kts.; 825 yards at 12 kts. The ship can stop in 1025 yards at 20 kts. (3 minutes), in 725 yards at 12 kts.

1911 BRITISH BATTLE-CRUISERS. No. **22 & 27** (Dreadnoughts).

QUEEN MARY (March, 1912), & **TIGER** (1913).

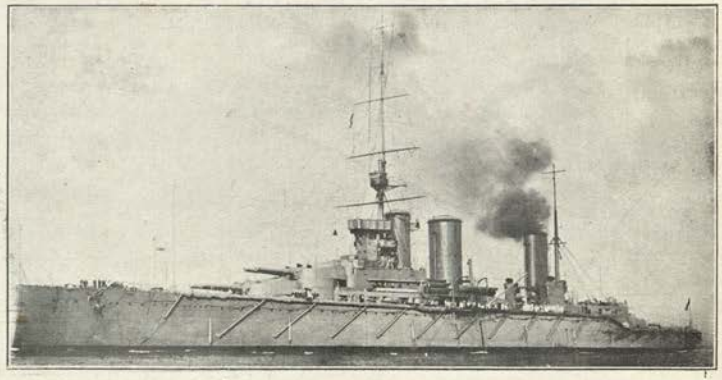
Normal displacement, 27,000 tons. *Full load*, tons. Complement

Length (*waterline*), 720 feet. Beam, 87 feet. *Maximum* draught, 30 feet. Length *over all*, 725 feet.

Guns: (*see note*).
8—13·5 inch (A^7)
16—4 inch
Torpedo tubes (21 inch):
2 *submerged* (broadside)
1 *submerged* (stern)

Armour (Krupp):
9" Belt (amidships) .. *aa*
4" Belt (ends) .....

[Generally of *Lion* type.]



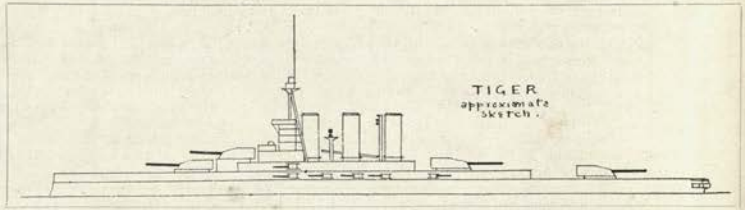
QUEEN MARY. *Photo, Abrahams & Sons.*

Note.—Tiger tripod forward. Rumoured that her secondary battery may possibly consist of 12—6 inch guns instead of 16—4 inch as *Queen Mary*.

Machinery: Turbine (Brown-Curtis). Boilers: Babcock. Designed H.P. 75,000=27 kts. Coal: *normal*, 1000 tons; *maximum* 3500 tons + oil, 1000 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Queen Mary	Palmer	Clydebank	Mar. '11	1913		Yarrow	33
Tiger	Clydebank	Clydebank	June '12	May '14		Babcock	

Tiger, 1911-12 estimates. *Queen Mary*, 1910-11 estimates.



1909 BRITISH BATTLE-CRUISERS (28 kts.) Nos. 16 & 15 (Dreadnoughts).

(Lion Class—2 Ships.)

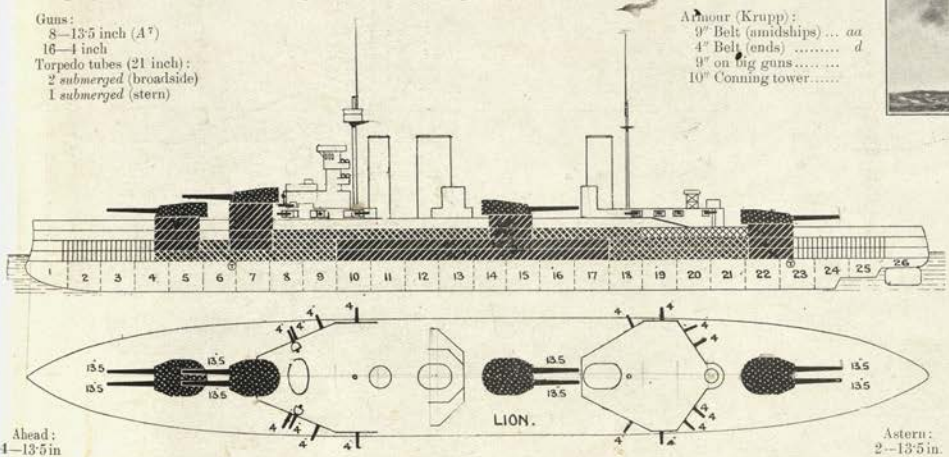
LION (6 August, 1910), **PRINCESS ROYAL** (29 April, 1911).

Normal displacement, 26,350 tons. *Full load*, 30,415 tons. Complement, 1000.

Length (*waterline*), 675 feet. Beam, 86½ feet. *Maximum* draught, 30 feet (31½ *full load*). Length *over all*, 680 feet.

Guns:
8—13·5 inch (A^7)
16—4 inch
Torpedo tubes (21 inch):
2 *submerged* (broadside)
1 *submerged* (stern)

Armour (Krupp):
9″ Belt (amidships) ... *aa*
4″ Belt (ends) ..... *d*
9″ on big guns ....
10″ Conning tower .....



Ahead: 4—13·5 in

Astern: 2—13·5 in.

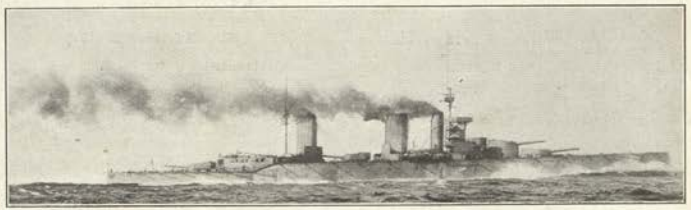
Broadside: 8—13·5 in.

Machinery: Parsons turbine. 4 screws. Boilers: 42 Yarrow. Designed H.P. 70,000=28 kts.
Coal: *normal* 1000 tons; *maximum* 3500 tons. Also oil: 1000 tons.

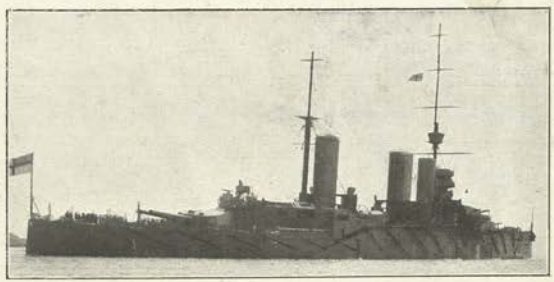
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials (mean)* *At 3/4 power*	*Full power*	*Boilers*	*Best recent speed*
Lion	Devonport Y.	Vickers	Nov.'09	1912	=24·5	=29	Yarrow	31·7
Princess Royal	Vickers	Vickers	April'10	1912			Yarrow	32·4

Engineering Notes.—*Lion* on trials used coal only. Speed by patent log. Max.=31·7 kts. Coal consumption was at rate of about 950 tons a day. *P. Royal* on 2/3 trial burned only 1·16 lbs. per h.p.

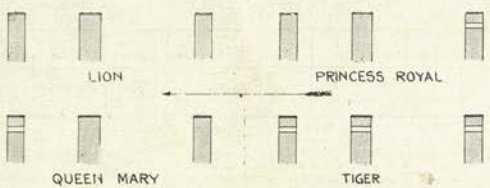
General Notes.—The *Lion* belongs to the 1909-10 Estimates; the *Princess Royal* is one of the "contingent Dreadnoughts" of the same year's estimates. On trials, flames from the fore funnel rendered the fire control station, then over fore funnel on tripod, most untenable. Alterations were consequently made. Average per ship, £2,000,000=about £73½ per ton.



Princess Royal. *Photo, Abrahams & Sons.*



Lion. *Photo, Abrahams & Sons.*



1909 BRITISH BATTLE-CRUISERS (26 kts.) No. **11,** also **21** (Dreadnoughts).

(Improved Invincible Class.)

INDEFATIGABLE (Oct., 1909), & **NEW ZEALAND** (1911).

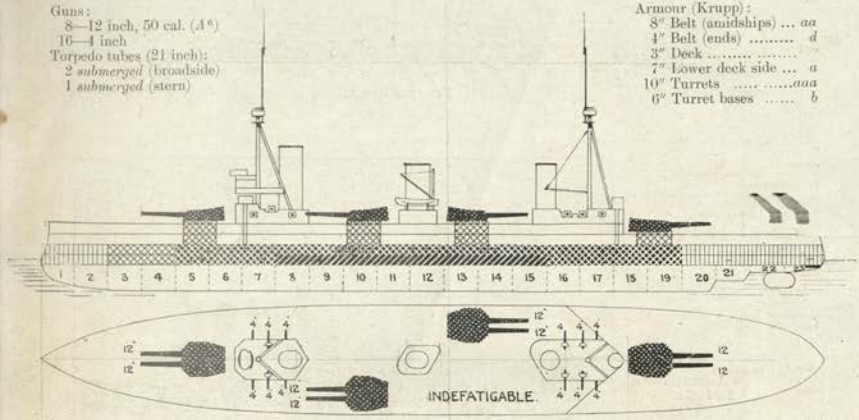
Note.—For a colonial cruiser, this class, see Australia.

Normal displacement, 18,750 tons. Complement, 800.

Length (*waterline*), 578 feet. Beam, 79½ feet. *Mean* draught, 27¾ feet. Length *over all*, 580 feet (*p.p.*, 555 feet).

Guns:
8—12 inch, 50 cal. (*A*[6])
16—4 inch
Torpedo tubes (21 inch):
2 *submerged* (broadside)
1 *submerged* (stern)

Armour (Krupp):
8″ Belt (amidships) ... *aa*
4″ Belt (ends) ..... *d*
3″ Deck ....
7″ Lower deck side ... *a*
10″ Turrets ....*aaa*
6″ Turret bases ..... *b*



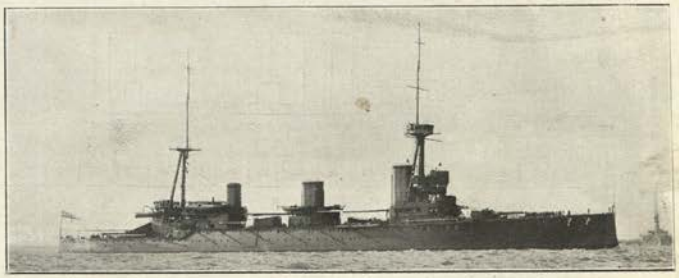
Ahead: 6—12 in. Broadside: 8—12 in. Astern: 6—12 in.

Machinery: Parsons turbine. 4 screws. Designed H.P. 43,000=25 kts. Boilers: Babcock.
Coal: *normal*, 1000 tons; *maximum*, 2500 + oil.

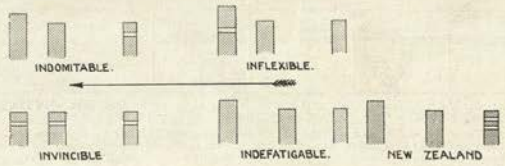
Gunnery Notes.—Fire control in fore turret fitted 1911. Improved fire controls fitted 1912. All 4 inch guns to be covered in.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials (mean)* 30 *hours* 3/4 8 *hours full*	*Boilers*	*Best recent speed*
Indefatigable	Devonport	Clydebank	Feb.'09	Feb.'11	32,000=24·6 =26·7	Babcock	29·13
New Zealand	Fairfield	Fairfield	1910	Jan.'12	=24·8 29,000=27	Babcock	

General Notes.—*Indefatigable* is an enlarged *Invincible*. Her special feature is that the amidship guns are further apart in order to permit of fairly free use on either broadside. Belongs to the 1908-09 Programme. Cost £1,547,426=£82·53 per ton. She is a better sea boat than the *Invincibles*. *New Zealand* was originally laid down for the colony of that name, but finally presented to the British Navy.



Photo, Symonds & Co.



1906 BRITISH BATTLE-CRUISERS (28 kts). Nos. **4, 3, 2** (Dreadnoughts).

(Invincible Class—3 Ships).

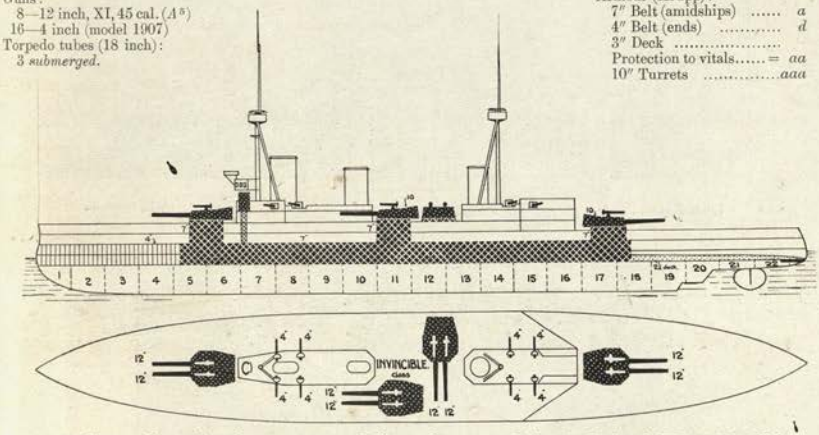
INVINCIBLE (April, 1907), **INFLEXIBLE** (June, 1907), & **INDOMITABLE** (March, 1907).

Normal Displacement, 17,250. Complement, 750.

Length (*waterline*), 560 feet. Beam, 78½ feet. *Maximum* draught feet. Length *over all*, 562 feet (*p.p.* 530).

Guns:
8—12 inch, XI, 45 cal. (*A*^{s})
16—4 inch (model 1907)
Torpedo tubes (18 inch):
3 submerged.

Armour (Krupp):
7″ Belt (amidships) ..... *a*
4″ Belt (ends) ..... *d*
3″ Deck .....
Protection to vitals.....= *aa*
10″ Turrets .....*aaa*

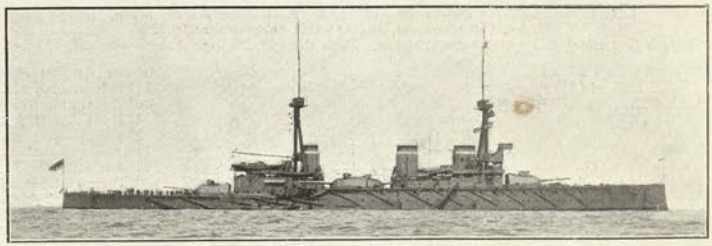


Machinery: Parsons' turbine. screws. Boilers: Yarrow or Babcock. Designed H.P. 41,000=25 kts. Coal: *normal* 1000 tons; *maximum* 3000 tons. Also oil fuel.

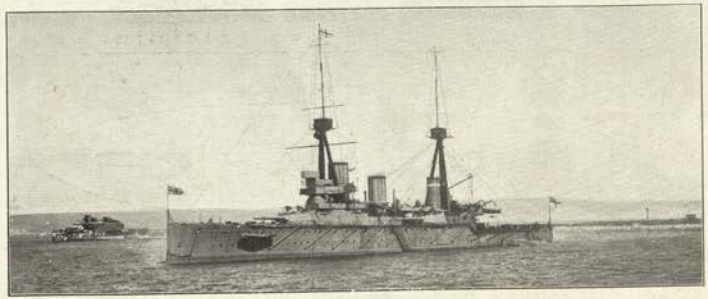
Name	*Builder.*	*Machinery, etc.*	*Laid down.*	*Completed.*	*Trials (mean).*	*Boilers.*	*Best recent speed.*
Invincible	Elswick	Humphrys & T.	April, '06	'08	46,000=26·6	Yarrow	28·6
Inflexible	Clydebank	Clydebank	Feb., '06	'08	=26·5	Yarrow	28·4
Indomitable	Fairfield	Fairfield	March, '06	'08	=26·1	Babcock	28·7

Gunnery Notes.— *Invincible* has electrical gear, others hydraulic. Trouble was experienced with the turntables and hoists of the amidship turrets of *Invincible*, but the worst difficulties were partly overcome about Feb., 1910.

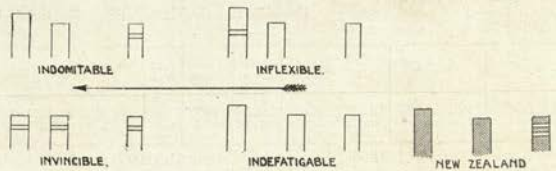
Notes.—Design of these ships altered in 1906. They were originally to have had 6″ belts. Belong to the 1905-6 Naval Programme. Average cost of each about £1,752,000=£101·6 per ton. These ships at full speed burn about 500 tons of coal a day, plus about 125 tons of oil. They are not very steady gun platforms. Average cost of machinery, about £472,000.



Photo, Symonds & Co.



Indomitable. *Photo, Symonds.*



1904 BRITISH BATTLESHIPS (18½ knot). (Pre-Dreadnoughts.)

(Lord Nelson Class—2 Ships).

LORD NELSON (September, 1906), & **AGAMEMNON** (June, 1906).

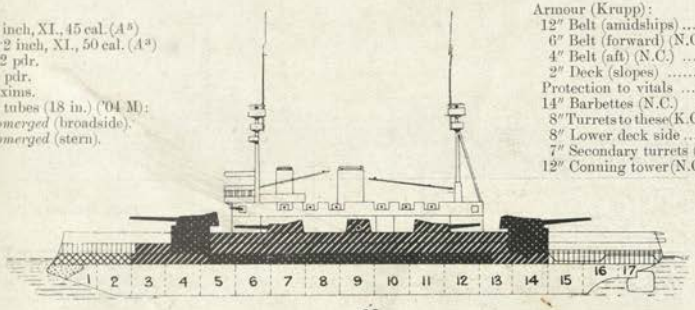
Normal displacement, 16,500 tons. Complement, 865.

Length (*waterline*), 435 feet. Beam, 79½ feet. *Mean* draught, 27 feet. Length *over all*, 445 feet.

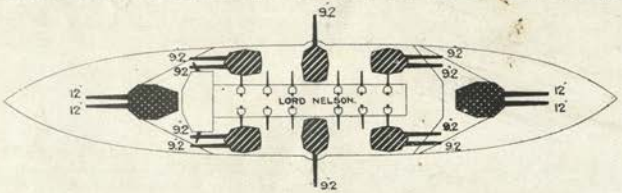
Guns:
4—12 inch, XI., 45 cal. (A^8)
10—9·2 inch, XI., 50 cal. (A^3)
15—12 pdr.
16—3 pdr.
2 Maxims.

Torpedo tubes (18 in.) ('04 M):
4 *submerged* (broadside).
1 *submerged* (stern).

Armour (Krupp):
12″ Belt (amidships) ..... *aaa*
6″ Belt (forward) (N.C.) *b*
4″ Belt (aft) (N.C.) ..... *d*
2″ Deck (slopes) .....
Protection to vitals ... = *aaaa*
14″ Barbettes (N.C.) ...*aaaa*
8″ Turrets to these (K.C) = *aaa*
8″ Lower deck side ..... *aa*
7″ Secondary turrets (N.C.) *a*
12″ Conning tower (N.C.) *aaa*



Ahead
2—12
4—9·2



Astern
2—12
4—9·2

Broadside: 4—12 in., 5—9·2 in.

Machinery: 2 sets 4 cylinder vertical triple expansion. 2 screws. Boilers: 15 Yarrow or Babcock. Designed H.P. 16,750 = 18·5 kts. Coal: *normal* 900 tons; *maximum* 2000 tons: also 400 tons oil.

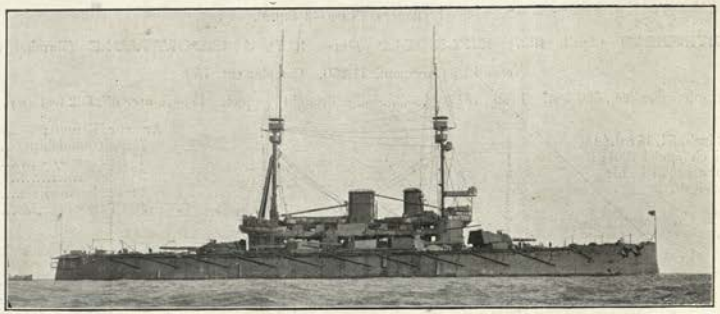
Gunnery Notes.—Big guns, central pivot mountings. Hoists, electric or hand all guns. Guns manœuvred hydraulic and hand gear. The 9·2 inch double turrets are not regarded as being anything like so satisfactory a design as the single 9·2 inch single turrets in earlier types.
Arcs of fire: 12 inch, 240°.

Torpedo Notes.—1904 model torpedoes. Complete electrical installation. 8 search-lights.

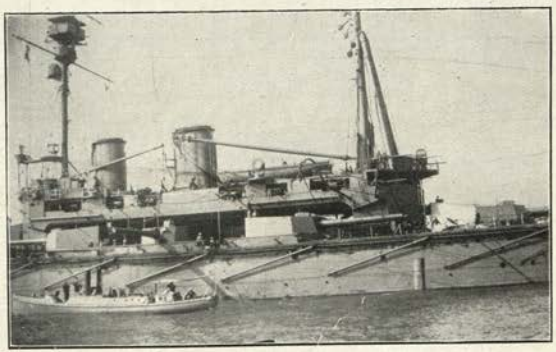
Engineering Notes.—Average cost of machinery, £213,000.

Name.	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*Trials*	*Boilers*	*Best recent speed*
Lord Nelson	Palmer	Palmer	Nov., '04	1908		... 17,445 = 18·9	Babcock	19
Agamemnon	Beardmore	Hawthorn Leslie	Oct., '04	1907		... 17,285 = 18·8	Yarrow	18·9

General Notes.—Estimates 1904-05. Estimated cost about £1,500,000 per ship. Designed by Sir P. Watts. These ships have an abnormally small tactical diameter and can practically spin round on their sterns. They heel considerably in doing so. In appearance they are quite unlike other British ships and have a distinctly French look.

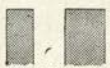


Lord Nelson. *Photo, Symonds.*



Photo, Oscar Parkes, Esq.

LORD NELSON


AGAMEMNON

1902 BRITISH BATTLESHIPS (18-19 knot).

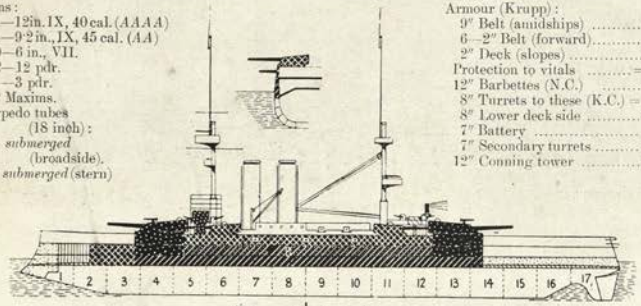
(King Edward Class—8 Ships).

COMMONWEALTH (May, 1903), **KING EDWARD** (July, 1903), **DOMINION** (August, 1903), **HINDUSTAN** (December, 1903), **ZEALANDIA** (*ex New Zealand*), (February, 1904). **HIBERNIA** (June, 1905), **AFRICA** (May, 1905) and **BRITANNIA** (December, 1904).

Normal displacement, 16350 tons. *Full load*, 17,500 tons. Complement, 777.
Length (*waterline*), 439 feet. Beam, 78 feet. *Mean* draught, 26¾ feet. Length *over all*, 453¾ feet.

Guns:
4—12in. IX, 40 cal. (*AAAA*)
4—9·2 in., IX, 45 cal. (*AA*)
10—6 in., VII.
12—12 pdr.
14—3 pdr.
2 Maxims.
Torpedo tubes (18 inch):
4 *submerged* (broadside).
1 *submerged* (stern)

Armour (Krupp):
9″ Belt (amidships) ..... *aa*
6—2″ Belt (forward)..... *a-f*
2″ Deck (slopes) .....
Protection to vitals ..... = *aaa*
12″ Barbettes (N.C.) ..... *aaa*
8″ Turrets to these (K.C.) = *aaa*
8″ Lower deck side ..... *aa*
7″ Battery ..... *a*
7″ Secondary turrets ..... *a*
12″ Conning tower ..... *aaa*



Ahead:
2—12 in.
2—9·2 in.
2—6 in.

Broadside: 4—12 in., 2—9·2., 5—6 in.

Astern:
2—12 in.
2—9·2 in.
2—6 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: assorted (*see notes*). Designed H.P. 18000 = 18·9 kts. Coal: *normal* 950 tons; *maximum* 2150 tons; *also* 400 tons oil (except *New Zealand*).

Armour Notes.—Main Belt is 7½ feet wide by about 285 feet long; lower edge 9″ thick amidships. Main deck 1″ thick; upper deck ditto amidships.

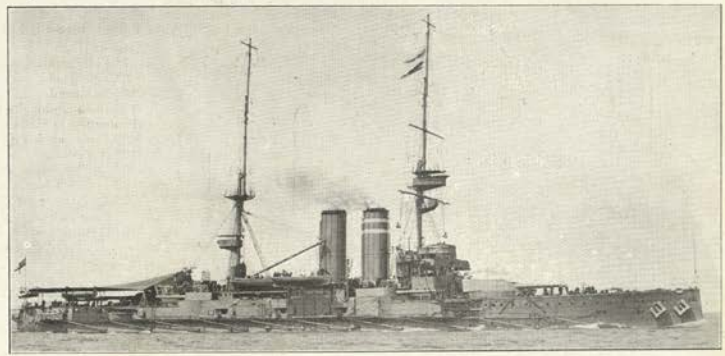
Gunnery Notes.—Loading positions, big guns: all round. Hoists, electric for all guns. Big guns manœuvred by hydraulic and hand gear. 6 inch guns: 13 feet about l.w.l.
Arcs of fire: 12 in., 240°; 9·2 in., about 135°; 6 in., 120°.

Torpedo Notes.—1904 model torpedoes carried. Nearly all round net defence. 8 searchlights. Stern tube not actually fitted in some.

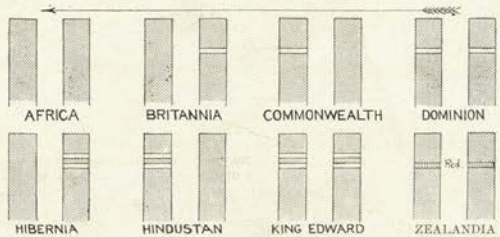
Engineering Notes.—120 revolutions = full power. Pressure: 200 lbs. Heating surface varies from 43,940 square feet in the earlier ships to 47,360 square feet in the later. Grate area from 1306 to 1402 square feet. Superheaters to all Babcock boilered ships except first three.

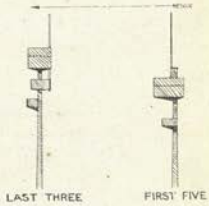
Name.	*Builder.*	*Machinery*	*Laid down*	*Completed.*	*Last refit*	*30 hours ¼ power.*	*8 hours full power.*	*Boilers.*	*Best recent speed.*
Commonwealth	Fairfield	Fairfield	June '02	1905	1907	12,769 = 17·9	18,538 = 19·01	16 Babcock	18·7
King Edward	Devonport	Harland & W.	Mar. '02	1905	1907	12,884 = 17·5	18,138 = 19·04	10 Babcock, 6 Cyl.	19·1
Dominion	Vickers	Vickers	May '02	1905	1907	12,843 = 18·3	18,439 = 19·35	16 Babcock	18·2
Hindustan	Clydebank	Clydebank	Oct. '02	1905	1907	12,926 = 17·7	18,521 = 19·08	18 Babcock, 3 Cyl.	18·7
Zealandia	Portsmouth	Humphrys & T.	Feb. '03	1905	1907	12,981 = 16·9	18,440 = 18·6	12 Niclausse, 3 Cyl.	18·9
Africa	Chatham	Clydebank	Jan. '04	1906	1907	12,860 = 17·5*	18,624 = 18·95*	Babcock	18·2
Britannia	Portsmouth	Humphrys & T.	Feb. '04	1906	1907	13,082 = 16·8	18,725 = 18·74	Babcock & Cyl.	17·5
Hibernia	Devonport	Harland & W.	Jan. '04	1906	1907	12,700 = 15·5	18,112 = 18·12*	Babcock	18·8

All were light on first trials.



Hindustan. All alike except last three, which have a double top on foremast and top mast abaft. *Photo, Cribb.*





Hibernia, Africa and Britannia. All alike except that *Africa* has high standard compass.

Class distinction.—To be recognised at once by rig and by the enormous funnels. No after-bridge.

General Notes.—Tactical diameter very small, about 340 yards at 15 knots. Extremely handy. Cost per ship about £1,500,000. The last British battleships designed by Sir William White. Estimates '01-'02, (3 ships), '02-'03, (2 ships), and '03-'04, (3 ships).

Coal consumption: Averages 11 tons an hour at 12,000 H.P., and from 15½-18 tons at full power. The Babcock boilered ships fitted with superheaters are considerably more economical than those not to be fitted. Economical speed: about 16 kts.

The ships cost about £120,000 per annum each to maintain with full crews; and £60,000 with two-thirds crews.

1902 BRITISH BATTLESHIPS (20 knot).

SWIFTSURE & TRIUMPH (January, 1903).

(Purchased from Chili, 1903).

Normal displacement, 11,800 tons. Complement, 700.

Length (*waterline*), 458 feet; Beam, 71 feet; *Maximum* draught, 24⅜ feet; Length (*over all*) 470 feet.

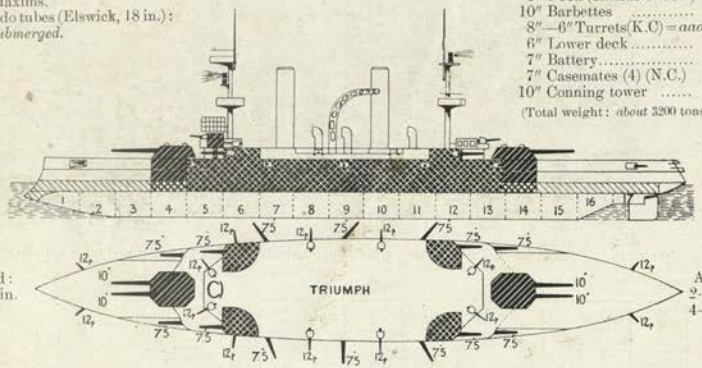
Guns:
4—10 inch, 45 cal. (*AAA*).
14—7·5 inch, II, 50 cal. (*A*).
14—14 pdr.
1—12 pdr., 8 cwt.
4—6 pdr.
4 Maxims.

Torpedo tubes (Elswick, 18 in.):
2 *submerged*.

Armour (Krupp):

7″ Belt (amidships) ...	*a*
3″ Belt (ends)	*e*
10″ Bulkheads	*aaa*
1½″ Deck (amidships) ...	
Protection to vitals .....=	*aa*
3″ Deck (outside citadel)	
10″ Barbettes	*aa*
8″—6″ Turrets(K.C) =	*aaa-aa*
6″ Lower deck	*a*
7″ Battery.....	*a*
7″ Casemates (4) (N.C.)	*a*
10″ Conning tower	*aa*

(Total weight: *about* 3200 tons).



Ahead:
2—10 in.
4—7·5

Astern:
2—10 in.
4—7·5

Broadside: 4—10 in., 7—7·5 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 12 Yarrow large tube. Designed H.P. 14,000=20 kts. Coal: *normal* 800 tons; *maximum* 2000 tons.

Armour Notes.—Belt is 15 feet wide, 7″ tapering to 3″, Citadel 260 feet long. 1″ screens in battery. 1″ main deck. Flat sided K.C. turrets.

Gunnery Notes.—Loading positions, big guns: all round, load in any position. Hoists, electric, all guns. Big guns manœuvred hydraulically. 7·5's run in and out hydraulically, otherwise hand worked. Spotting platforms low. *Swiftsure's* 7·5 loading arrangements are inferior to those of *Triumph* and cannot maintain the same rate of fire. In both the arcs of training of 7·5's are small.

Ammunition carried: 10 in., 86 per gun; 7·5 in., 150 per gun.

Torpedo Notes.—Main deck shelf for nets. Amidship defence only.

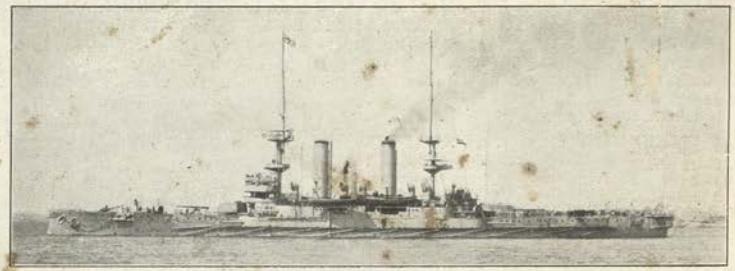
Engineering Notes.—These ships are very fast for short spurts, but cannot maintain speed well in a sea way. At full power the vibration is great. *Actual* full speed radius about 3,000 miles.

Trials.—

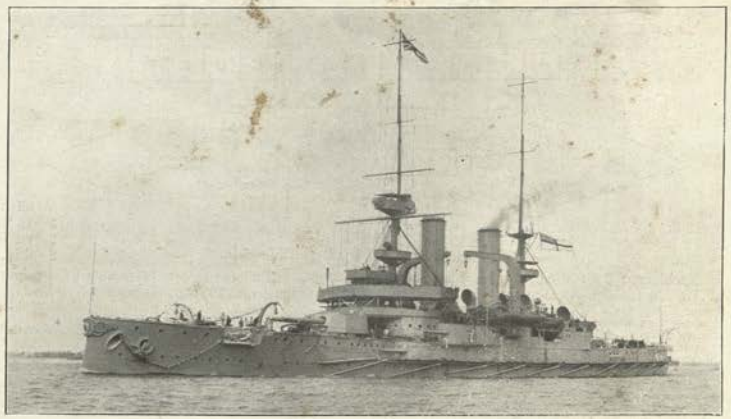
Name.	*Builders.*	*Engines and Boilers.*	*Laid down.*	*Completed*	*30 hours 3/5, 150 revs.*	*6 hours full, 152 revs.*	*Boilers.*	*Present speed.*
Swiftsure	Elswick	Humphrys and T.	March, '02	1904	8700=17	14,018=20	Yarrow	19·1
Triumph	Vickers	Vickers	March, '02	1904		14,090=20·17,	Yarrow	19·3

Coal consumption averages at 10,000 H.P. 9 tons per hour; at 14,000 H.P. (20 kts.) 12—13 tons per hour. Both ships tended to be "coal eaters" originally, but in service have proved very fairly economical as a rule. In 1907 manœuvres both ships averaged about 18 kts.

General Notes.—Purchased from Chili for £949,000 each. Scantlings much lighter than in normal British ships. Designed by Sir E. J. Reed.



SWIFTSURE. *Photo, Symonds*



Differences.—

SWIFTSURE
Higher cowls.
Bow scroll.
Very conspicuous fire controls.

TRIUMPH
Low cowls
No bow scrol

1901 BRITISH BATTLESHIPS - (18 knot).

(Queen Class—2 Ships).

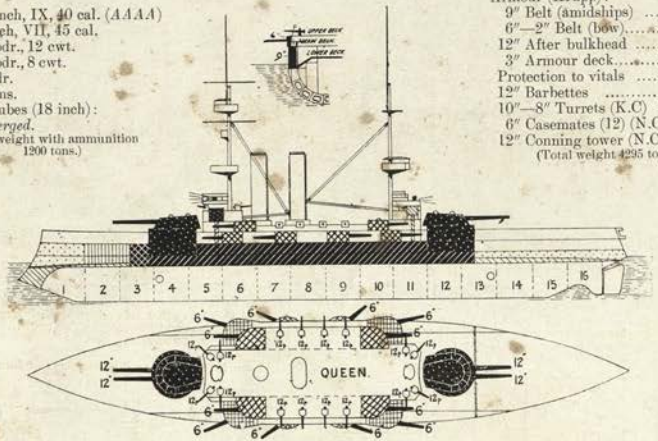
QUEEN (March, 1902) & PRINCE OF WALES (March, 1902).

Displacement, 15,000 tons. Complement, 750 (flagship, 789).

Length (*waterline*), 411 feet. Beam, 75 feet. *Maximum* draught, 29 feet. Length *over all*, 430 feet.

Guns:
4—12-inch, IX, 40 cal. (*AAAA*)
12—6 inch, VII, 45 cal.
16—12 pdr., 12 cwt.
2—12 pdr., 8 cwt.
6—3 pdr.
2 Maxims.
Torpedo tubes (18 inch):
4 *submerged*.
(Total weight with ammunition 1200 tons.)

Armour (Krupp):
9″ Belt (amidships) .....*aa*
6″—2″ Belt (bow).....*a-f*
12″ After bulkhead .....*aaa*
3″ Armour deck.....
Protection to vitals .....=*aaa*
12″ Barbettes .....*aaa*
10″—8″ Turrets (K.C) = *aaa-aa*
6″ Casemates (12) (N.C.) ..... *b*
12″ Conning tower (N.C.) ...*aaa*
(Total weight 4295 tons).



Ahead:
2—12 in.
4—6 in.

Astern:
2—12 in.
4—6 in.

Broadside: 4—12 in., 6—6 in.

Machinery: 2 sets 3 cylinder vertical inverted triple expansion. 2 screws. Boilers: *Queen*, 15 Babcock, *Prince of Wales*, 20 Belleville. Designed H.P. 15,000=18 kts. Coal: *normal* 900 tons; *maximum* 2100 tons.

Armour Notes.—Belt is 15 feet wide by 300 feet long, from bow. Flat-sided turrets, K.C.

Gunnery Notes.—Loading positions, big guns: all round. Hoist, for 6 inch, electric. Big guns manœuvred by hydraulic gear. Arcs of fire: Big guns, 260°; secondary guns, 120°. Fire control fitted or fitting as plan. Ammunition carried: 12 in., 80 rounds per gun; 6 in., 200 per gun.

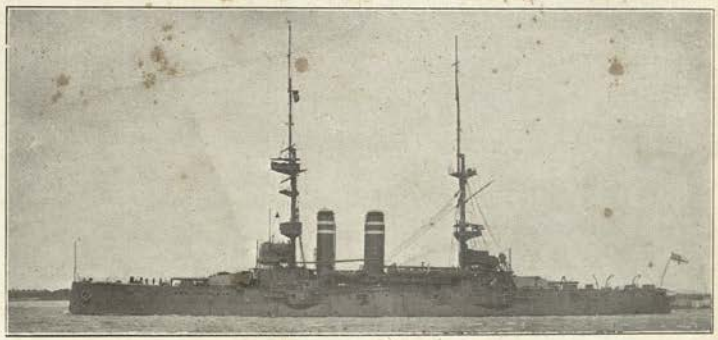
Torpedo Notes.—Main deck shelf for nets. Defence almost all round. 2 torpedo launches carried. 8 searchlights.

Engineering Notes.—Pressure 300 lbs. at boilers, reduced to 250 at engines. Heating surface, *Queen* 38,400 sq. feet; *Prince of Wales* 37,000 sq. feet.

Name.	*Built at*	*Engines & Boilers by*	*Laid down*	*Completed*	*30 hours 4/5 power. 101 revs.*	*8 hours full power. 110 revs.*	*Speed last Boilers. sea trial.*
Queen	Devonport	Harland & Wolff	March, '01	1904	11,670=16·97	15,556=18·39	Babcock 18
Prince of Wales	Chatham	Greenock Foundry	March, '01	1904	11,669=17·04	15,564=18·45	Belleville 18

Coal consumption in service: Averages 9 tons an hour at 10,000 H.P. (15 kts.), 12—14 at 15,000 H.P. (18 kts.) On first trials the *Queen* was the more economical of the two especially at mean powers

General Notes.—Very handy ships. Slightly improved *Londons*. Open 12 pdr. batteries and kidney-shaped fighting tops. Cost per ship averaged just over £1,000,000.



QUEEN. *Photo, Symonds.*

Class distinctions.—Kidney-shape lower tops. Open 12 pdr. battery. Flat-sided turrets. No scuttles to lower deck forward.

1898 BRITISH BATTLESHIPS (19 knot).

(Duncan Class—5 Ships.)

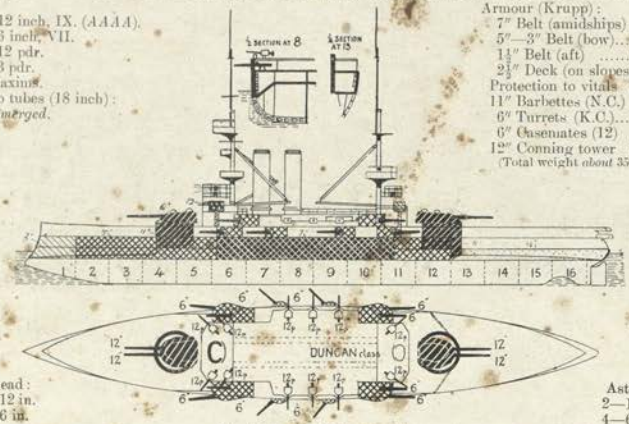
RUSSELL (February, 1901), **ALBEMARLE** (March, 1901), **DUNCAN** (March, 1901), **CORNWALLIS** (July, 1901), **EXMOUTH** (August, 1901).

Normal displacement, 14,000 tons. Complement, 750 (flagships 778).

Length (*waterline*), 418 feet. Beam, 75½ feet. *Maximum* draught, 27¼ feet. Length *over all*, 429 feet.

Guns:
4—12 inch, IX. (*AAAA*).
12—6 inch, VII.
12—12 pdr.
6—3 pdr.
2 Maxims.

Torpedo tubes (18 inch):
4 *submerged*.



Armour (Krupp):
7″ Belt (amidships) ..... *a*
5″—3″ Belt (bow)..... *b-a*
1½″ Belt (aft) .....
2½″ Deck (on slopes) ...
Protection to vitals .....=*aa*
11″ Barbettes (N.C.) ... *aa*
6″ Turrets (K.C.).....=*aa*
6″ Casemates (12) ..... *b*
12″ Conning tower ..... *aaa*
(Total weight *about* 3500 tons).

Ahead:
2—12 in.
4—6 in.

Astern:
2—12 in.
4—6 in.

Broadside: 4—12 in., 6—6 in.

Machinery: 2 sets 4 cylinder vertical inverted triple expansion. 2 screws. Boilers: 24 Belleville. Coal: *normal* 900 tons; *maximum* 2000 tons. Designed H.P. 18,000=19 kts. *Nominal* radius 7,200 at 10 kts.

Armour Notes.—Main belt is 14 feet wide by 285 feet long; lower edge is full thickness. Flat-sided turrets (K.C.)

Gunnery Notes.—Loading positions, big guns = all round. Hoists, for 6 inch, electric and hand. Big guns manœuvred by hydraulic gear. Fire control stations fitted 1905-6.
Arcs of fire: 12 in., 240°; 6 in., 120°.

Engineering Notes.—Machinery, etc., weighs 1580 tons.

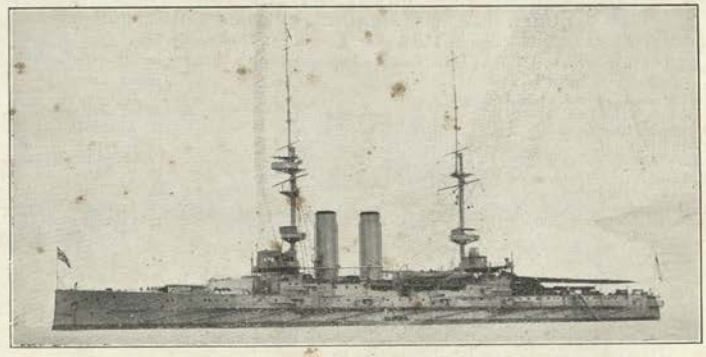
Name.	*Builder.*	*Engines by*	*Laid down*	*Completed.*	*Last big Refit.*	*First trials:— 30 hours at 4/5.*	*8 hours full.*	*Boilers.*	*Last recorded best speed.*
Russell	Palmer	Palmer	March, '99	1903	—	15,695=17·95	18,222=19·3	Belleville	19·8
Duncan	Thames I.W.	Thames I.W.	July, '99	1903	—	13,717=18·1	18,232=19·11	Belleville	20·1
Cornwallis	Thames I.W.	Thames I.W.	July, '99	1904	—	15,694=17·94	18,238=18·98*	Belleville	19·56
Exmouth	Laird	Laird	Aug. '99	1903	—	15,774=18	18,346=19·03	Belleville	20·0
Albemarle	Chatham	Thames I.W.	Jan., '00	1903	'09	13,587=17·2*	*18,296=18·6	Belleville	19·8

*Run in bad weather.

Coal consumption averages 2¾ tons an hour at 10 kts.; at 13,000 H.P. (17 kts.) about 10¾ tons an hour; at 18,000 H.P. (19 kts.) about 15 tons an hour or less. All these ships are excellent steamers, and make or exceed their speeds in almost any weather. Boilers are of 1900 pattern.

General Notes.—The ships are proving very passable sea boats. Hull without armour weighs 9055 tons.

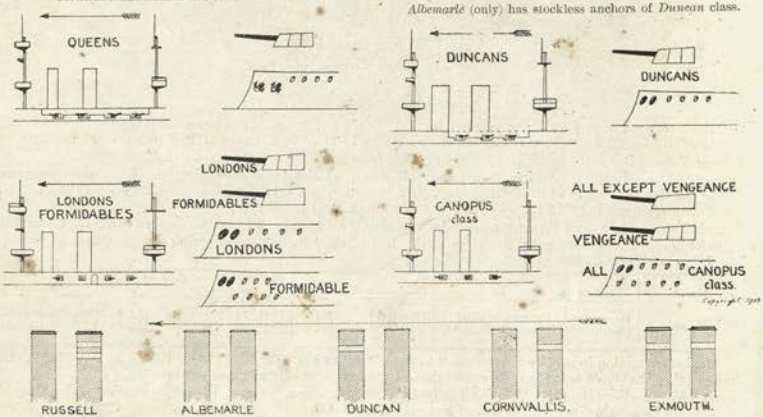
Cost per ship, *complete*, just over £1,000,000. Very handy. *Montagu*, of this class, wrecked on Lundy, 1906.



Albemarle. *Photo, Symonds.*

Distinctions.—All identical with each other. They are to be distinguished from other battleships by their large round funnels. Open upper deck. They are lower in the water than the *Londons* and *Formidables*. No cowls.
Russell and *Exmouth* have very large funnel tops and the former has conspicuous steampipes.
Cornwallis has smaller fire controls than the others.

Albemarle (only) has stockless anchors of *Duncan* class.



1898 BRITISH BATTLESHIPS (18 knot).

(Formidable Class—3 Ships).

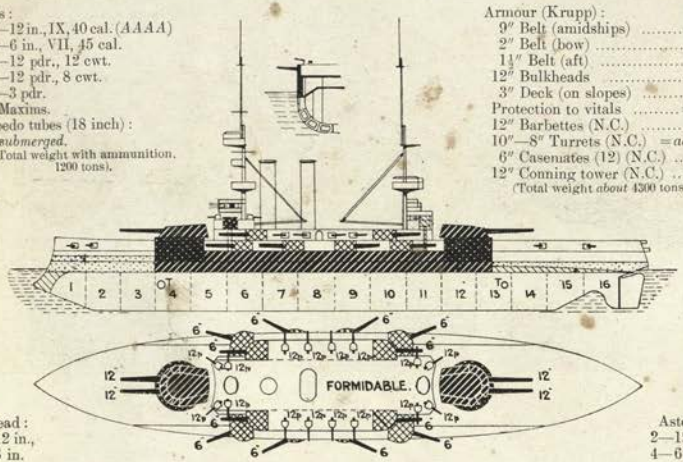
FORMIDABLE (Nov. 1898), **IRRESISTIBLE** (Dec. 1898), & **IMPLACABLE** (March, 1899).

Displacement, 15,000 tons. Complement, 780 (flagship 810).

Length (*waterline*), 411 feet. Beam, 75 feet. *Maximum* draught, 29 feet. Length *over all*, 430 feet.

Guns:
4—12 in., IX, 40 cal. (*AAAA*)
12—6 in., VII, 45 cal.
16—12 pdr., 12 cwt.
2—12 pdr., 8 cwt.
6—3 pdr.
2 Maxims.
Torpedo tubes (18 inch):
4 *submerged*.
(Total weight with ammunition, 1200 tons).

Armour (Krupp):
9″ Belt (amidships) ..... *aa*
2″ Belt (bow) ..... *f*
1½″ Belt (aft) ..... *f*
12″ Bulkheads ..... *aaa*
3″ Deck (on slopes) .....
Protection to vitals .....=*aaa*
12″ Barbettes (N.C.) ..... *aaa*
10″—8″ Turrets (N.C.) =*aaa-aa*
6″ Casemates (12) (N.C.) ... *b*
12″ Conning tower (N.C.) ... *aaa*
(Total weight *about* 4300 tons)



Ahead: 2—12 in., 4—6 in.

Astern: 2—12 in., 4—6 in.

Broadside: 4—12 in., 6—6 in.

Machinery: 2 sets 3 cylinder vertical inverted triple expansion. 2 screws. Boilers: 20 Belleville. Designed H.P. 15,000=18 kts. Coal: *normal* 900 tons; *maximum* 2200 tons.

Armour Notes.—Belt is 15 feet wide by 216 feet long; 2″ continuation to bow; lower edge is normal thickness. Curved turrets of K.N.C.

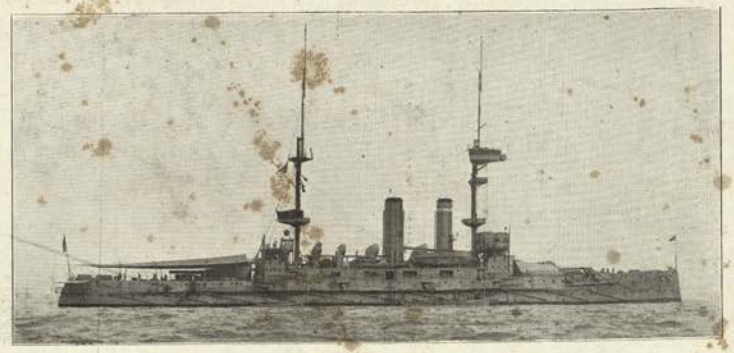
Gunnery Notes and *Torpedo Notes.*—As for later *Formidables*, previous page.

Engineering Notes.—(See also later *Formidables*).

Name.	*Built at*	*Engines & Boilers by*	*Laid down.*	*Completed*	*Refit*	*30 hours 4/5 power*	*8 hours full power.*	*Boilers.*	*Speed last sea trial.*
Formidable	Portsmouth	Earle	March, '98	1901	'08-'09	11,618=17·15	15,511=18·13	Belleville	18·4
Irresistible	Chatham	Maudslay	April, '98	1902	*nil*	11,626=17·5	15,603=18·20	Belleville	18·5
Implacable	Devonport	Laird	July, '98	1902	'08-'09	11,618=16·81	15,244=18·22	Belleville	18·7

Coal consumption in service averages 8 tons an hour, at 10,000 H.P. (15 kts.), 11½ tons at 15,000 H.P. (18 kts.)

General Notes.—Very handy ships, answer the least touch of helm. Average cost just over £1,000,000 per ship.



Implacable. *Photo, Symonds*

Differences—

Class distinctions:—

Formidable / *London* / *Queen*	Fore funnel close to foremast and smaller than after. Oval turrets. No scuttles lower deck forward. Flat-sided turrets. Open upper deck. Flat-sided turrets.
Duncan	Funnels as in *Formidable*, but equal sized and big. Slightly smaller ship. Open upper deck. Flat-sided turrets.
Canopus	Funnels close together, and more amidships. Shorter masts, closer together, ship lower in water, and generally *smaller*. Oval turrets.

1898 BRITISH BATTLESHIPS.—(18 knot).

(London Class—3 Ships).

LONDON (Sept., 1899), **BULWARK** (Oct., 1899), **VENERABLE** (Nov., 1899).

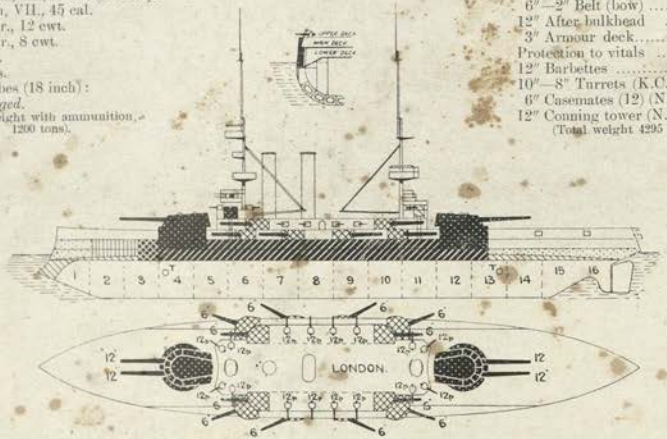
Displacement, 15,000 tons. Complement, 750 (flagship, 789).

Length (*waterline*), 411 feet. Beam, 75 feet. *Maximum* draught, 29 feet. Length *over all*, 430 feet.

Guns:
4—12 inch, IX., 40 cal. (*AAAA*).
12—6 inch, VII., 45 cal.
16—12 pdr., 12 cwt.
2—12 pdr., 8 cwt.
6—3 pdr.
2 Maxims.

Torpedo tubes (18 inch):
4 *submerged*.
(Total weight with ammunition, 1200 tons).

Armour (Krupp):
9″ Belt (amidships) ..... *aa*
6″—2″ Belt (bow) ..... *a-f*
12″ After bulkhead ..... *aaa*
3″ Armour deck.....
Protection to vitals ..... = *aaa*
12″ Barbettes ..... *aaa*
10″—8″ Turrets (K.C.) = *aaa-aa*
6″ Casemates (12) (N.C.) ... *b*
12″ Conning tower (N.C.) ... *aaa*
(Total weight 4295 tons).



Ahead:
2—12 in.
4—6 in.

Astern:
2—12 in.
4—6 in.

Broadside: 4—12 in., 6—6 in.

Machinery: 2 sets 3 cylinder vertical inverted triple expansion. 2 screws. Boilers: 20 Belleville. Designed H.P. 15,000 = 18 kts. Coal: *normal* 900 tons; *maximum* 2100 tons.

Armour Notes.—Belt is 15 feet wide by 300 feet long, from bow. Flat sided K.C. turrets.

Gunnery Notes.—Loading positions, big guns: all round. Hoist, for 6 inch, electric. Big guns manœuvred, hydraulic gear. Arcs of fire: Big guns, 260°; secondary guns, 120°.
Ammunition carried: 12 in., 80 rounds per gun; 6 in. 200 per gun.

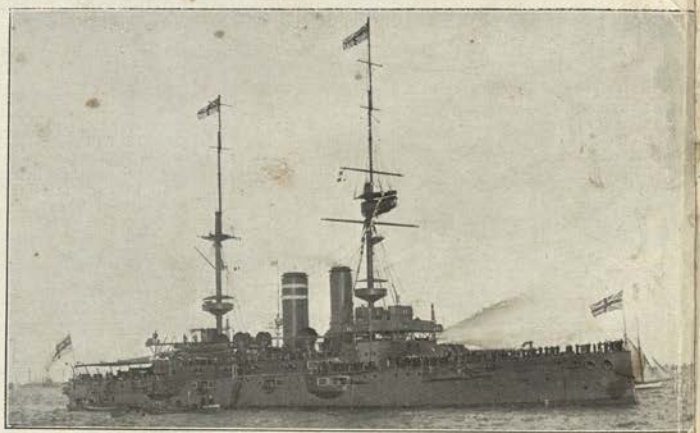
Torpedo Notes.—Main deck shelf for nets. Defence almost all round. 2 torpedo launches carried. 6 searchlights.

Engineering Notes.—Pressure, 300 lbs. at boilers, reduced to 250 at engines. Heating surface, 37,000 square feet.

Name.	*Built at*	*Engines by*	*Laid down*	*Completed.*	*Last Refit.*	*30 hours 4/5-power. 101 revs.*	*8 hours full power. 110 revs.*	*Boilers.*	*Speed last sea trial*
London	Portsmouth	Earle	Dec. '98	1902	'08-'09	11,718 = 16·4	15,264 = 18·10	Belleville	17·75
Bulwark	Devonport	Hawthorn Leslie	March, '99	1902	*nil*	11,755 = 16·8	15,353 = 18·15	Belleville	18·5
Venerable	Chatham	Maudslay	Nov. '99	1902	'08-'09	11,364 = 16·8	15,345 = 18·40	Belleville	18·3

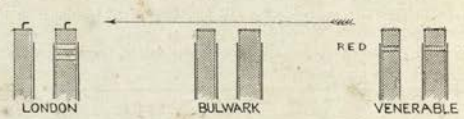
Coal consumption in service: Averages 8¼ tons an hour at 10,000 H.P. (15 kts.), 11¾ at 15,000 H.P. (18 kts.).

General Notes.—Very handy ships. Cost per ship averaged just over £1,000,000.



London. *Photo, Symonds.*

Differences.—



1394 BRITISH BATTLESHIPS (16½ knot).

(Majestic Class—9 Ships).

MAGNIFICENT (December, 1894), **MAJESTIC** (January, 1895), **HANNIBAL** (April, 1895), **PRINCE GEORGE** (August, 1895), **VICTORIOUS** (October, 1895), **JUPITER** (November, 1895), **MARS** (March, 1896), *also* **CÆSAR** (September, 1896), & **ILLUSTRIOUS** (September, 1896).

Displacement, 14,900 tons. Complement, 757.

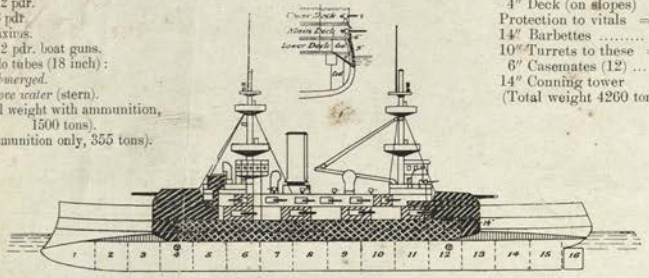
Length (*waterline*), 399 feet. Beam, 75 feet. *Maximum* draught, 30 feet. Length *over all*, 413 feet.

Guns:
4—12 inch, VIII., 35 cal. (*AAA*)
12—6 inch, *wire*, 40 cal.
16—12 pdr.
12—3 pdr.
2 Maxims.
2—12 pdr. boat guns.

Torpedo tubes (18 inch):
4 *submerged*.
1 *above water* (stern).

Total weight with ammunition, 1500 tons).
(Ammunition only, 355 tons).

Armour (Harvey):
9″ Belt (amidships) *a*
14″ Bulkheads ..... *aa*
4″ Deck (on slopes)
Protection to vitals = *aaa*
14″ Barbettes ..... *aa*
10″ Turrets to these = *aa*
6″ Casemates (12) ... *c*
14″ Conning tower *aa*
(Total weight 4260 tons).



Ahead:
2—12 in.
2—6 in.

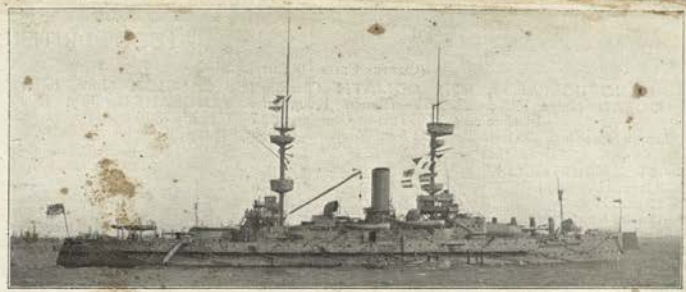
Astern:
2—12 in.
2—6 in.

Broadside: 4—12 in. (*AAA*), 6—6 in.

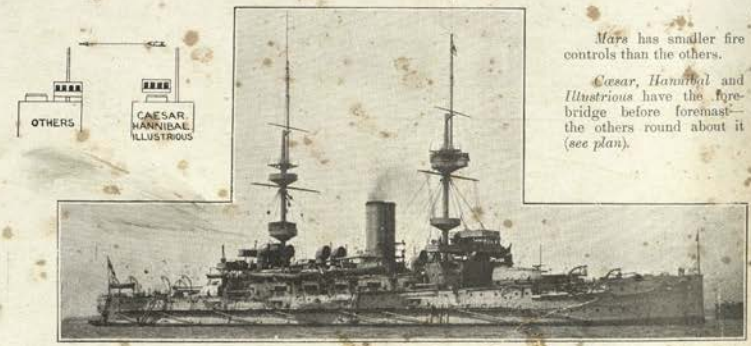
Machinery: 2 sets 3 cylinder vertical inverted triple expansion. 2 screws. Boilers: 8 cylindrical, with 4 furnaces each. Designed H.P. *natural* 10,000 = 16·5 kts.; *forced* 12,000 = 17·5 kts. Coal: *normal* 1200 tons; *maximum* 2,000 tons (always carried). Oil, 400 tons.

Armour Notes.—Belt is 16 feet wide by 220 feet long. *Cæsar* and *Illustrious* have circular barbettes.
Gunnery Notes.—Loading positions, big guns: all round (end on in first two and all round for a few rounds). Hoists, electric and hand. Big guns manœuvred, hydraulic and hand.
Arcs of fire: Big guns, 260°; Casemates, 120°.
Torpedo Notes.—Midship net defence. Nets stow on main deck shelf in most of the class (all are being so fitted). Two torpedo launches. 6 searchlights.
Engineering Notes.—Machinery and boilers weigh 1,600 tons. 32 furnaces. Heating surface, 24,400 square feet. All fitting or fitted for oil fuel. Screws: 17 feet in diameter, 19½ feet pitch, 4 bladed. Cylinders: 40, 59 and 88 ins. diameter. Stroke: 51 ins. Pressure: 155 lbs.

Name.	*Builder.*	*Engines by*	*Laid down*	*Completed*	*Fine trials:— 8 hours nat.*	*8 hours f. d.*	*Best recent speed*
Magnificent	Chatham	Penn	Dec., '93	1895	10,301=16·50	12,157=18·4	15·9
[illegible]	Portsmouth	Vickers	Feb., '94	1895	10,418=16·39	12,097=17·9	16·8
[illegible]	Pembroke	Harland & Wolff	April '94	1897	10,357=16·30	12,138=18·0	16·2
[illegible]	[illegible]	[illegible]	Sept., '94	1896	10,464=16·52	12,253=18·3	[illegible]
[illegible]	[illegible]	Hawthorn [illegible]	May, '94	1897	10,219=16·30	12,206=18·7	[illegible]
[illegible]	Clydebank	[illegible]	Oct., '94	1897	10,258=16·30	12,375=18·4	[illegible]
[illegible]	[illegible]	Laird	June, '94	1897	10,159=15·56	12,431=17·5	[illegible]
[illegible]	[illegible]	Maudslay	March, '95	1897	10,630=16·70	12,652=18·7	[illegible]
[illegible]	[illegible]	Penn	March, '95	1898	10,551=16·56	12,112=18·36	16½
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



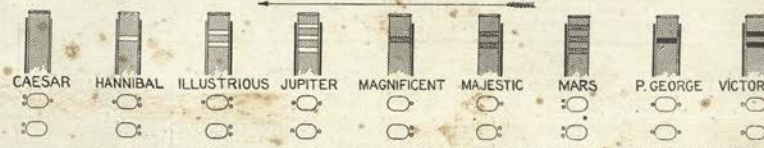
Magnificent *only.* (Note different rig.) *Photo, Cousens.*



Mars has smaller fire controls than the others.

Cæsar, *Hannibal* and *Illustrious* have the fore-bridge before foremast—the others round about it (*see plan*).

Illustrious. *Photo, Symonds.*



All the ships were *light* on trials and drawing about 2 feet less than the normal. Sea trials run with full coal and stores aboard.

Coal consumption for the class averages: at 8 kts., 1¼ ton an hour; at 8,000 H.P. (15 kts.), 8½ tons; [illegible] H.P., [illegible] kts.), 10½ tons. The *Hannibal*, which is the most economical ship, burns somewhat less.

[illegible] Notes.—150 w. t. compartments. 208 w. t. doors. Circle of immersion: at 13 kts., 150 yards; with one engine, 350 yards. Steam and [illegible] coal. Cost [illegible] £1,000,000 per ship complete.

1896 BRITISH BATTLESHIPS (18¼ knot).

(Canopus Class—6 Ships).

CANOPUS (October, 1897), **GOLIATH** (March, 1898), **ALBION** (June, 1898), **OCEAN** (July, 1898), **GLORY** (March, 1899), *also* **VENGEANCE** (July, 1899).

Displacement, 12,950 tons. Complement, 750 (flagship 780).

Length (*waterline*), 400 feet. Beam, 74 feet. *Maximum* draught, 26½ feet. Length *over all*, 418 feet.

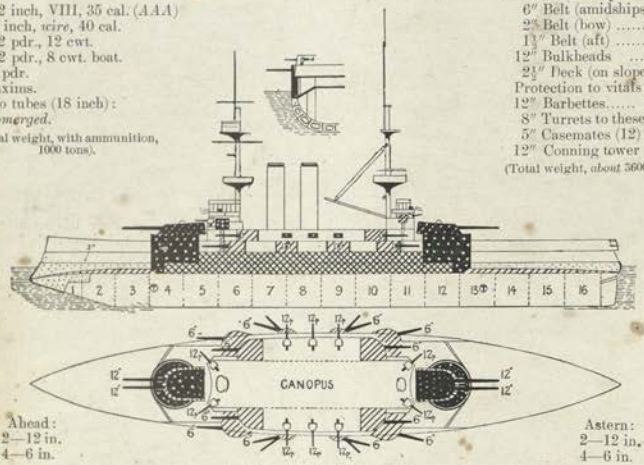
Guns:
- 4—12 inch, VIII, 35 cal. (*AAA*)
- 12—6 inch, *wire*, 40 cal.
- 10—12 pdr., 12 cwt.
- 2—12 pdr., 8 cwt. boat.
- 6—3 pdr.
- 2 Maxims.

Torpedo tubes (18 inch):
- 4 *submerged*.

(Total weight, with ammunition, 1000 tons).

Armour (Harvey-nickel):
- 6″ Belt (amidships) *b*
- 2″ Belt (bow) ..... *f*
- 1½″ Belt (aft) ..... *f*
- 12″ Bulkheads ..... *aaa*
- 2½″ Deck (on slopes).
- Protection to vitals ... = *a*
- 12″ Barbettes..... *aaa-aa*
- 8″ Turrets to these...
- 5″ Casemates (12) ... *c*
- 12″ Conning tower ... *aaa*

(Total weight, *about* 3600 tons).



Ahead:
2—12 in.
4—6 in.

Astern:
2—12 in.
4—6 in.

Broadside: 4—12 in., 6—6 in.

Machinery: 2 sets 3 cylinder vertical inverted triple expansion. 2 screws. Boilers: 20 Belleville. Designed H.P. 13,500 = 18·25 kts. Coal: *normal* 1000 tons; *maximum* 2300 tons.

Armour Notes.—Belt is 14 feet wide by 210 feet long. Barbettes circular, the thickness given being the maximum. Belt is normal thickness at lower edge. Weight of side armour only, 1740 tons. Main deck 1″ steel. Barbettes 37 feet in diameter. Circular turrets (H.N.)

Gunnery Notes.—Loading positions, big guns: all round. *Vengeance's* load in any position also. Big guns manœuvred: hydraulic and hand gear. Hoists, for 6 inch, electric and hand. Fitting with fire control stations as plan. Arcs of fire: Big guns, 260°; casemates, 120°.

Torpedo Notes.—Net defence amidships; stowage on shelf at main deck level. Electric machinery: 3 dynamos, 8 electric fans for ventilation.

Name	*Built at*	*Engines and boilers by*	*Laid down*	*Completed*	*Last Refit.*	30 hours 4/5. 99-102 revs.	8 *hours full power.* 107-110 *revs.*	*Boilers.*	*Best recent speed.*
Canopus	Portsmouth	Greenock Fdy.	Jan., '97	1900	'07	10,454 = 17·2	13,763 = 18·5	Belleville	16·5
Goliath	Chatham	Penn	Jan., '97	1900	'07	10,413 = 17·3	13,918 = 18·4	Belleville	
Albion	Thames I.W.	Maudslay	Dec., '96	1902	'06	10,809 = 16·8*	13,885 = 17·8*	Belleville	18·2
Ocean	Devonport	Hawthorn Leslie	Feb., '97	1900	'10	10,374 = 16·2	13,728 = 18·5	Belleville	17·8
Glory	Laird	Laird	Dec., '96	1901	'07	10,587 = 16·8	13,745 = 18·1	Belleville	17·6
Vengeance	Vickers	Vickers	Aug., '97	1901	'05	10,387 = 17·2	13,852 = 18·5	Belleville	18

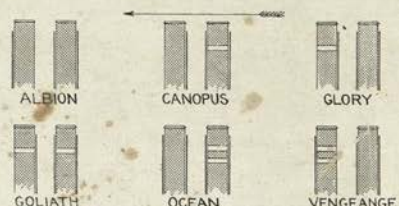
* Run in a gale.

Coal consumption averages: 9 tons an hour at 10,000 H.P. (16·5 kts.), 12½ tons at 13,500 H.P. (18·25 kts.)

In 1907 manœuvres *Vengeance* and *Ocean*, in the chase, beat all the *King Edward* class except *King Edward*; but the ships are getting worn out, and few can now steam well except for short spurts.

Vengeance.

Differences.—



For identifications of class from *Formidables* and *Duncans* see *Formidable* class.

Albion has specially large fire control on fore.

Engineering Notes.—10 revolutions = 12½ kts. Boilers: 15—9 element generators, and 5—8 element generators. Total heating surface (including economisers), 33,700 square feet. Grate area 1055 feet. Pressure, 300 lbs., reduced to 250 lbs. at engines. Distilling machinery: 4 evaporators, capacity 68 tons per 24 hours. Distillers produce 40 tons per day. Auxiliary engines: 4 air compressors, 2 boat hoists, 2 refrigerating, 2 coal hoists, 5-blowing, 2 steam fans. Funnels 11 feet in diameter. Height above furnace bars, 90 feet. Screws: 4 bladed. Diameter of cylinders 30 in., 49 in., and 80 in. Stroke 51 in.

General Notes.—Tactical diameter, extreme helm at 15 kts. 450 yards; with the engines, 350 yards. Cost, *complete* [illegible] £900,000 per ship. Maintenance cost, in full commission, about £94,000 per annum, per ship.

(MINOTAUR CLASS—3 SHIPS.)

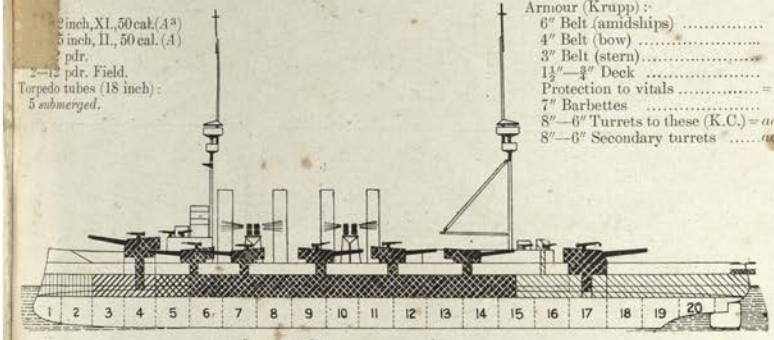
MINOTAUR (June, 1906), **DEFENCE** (April, 1907), **SHANNON** (—1906).

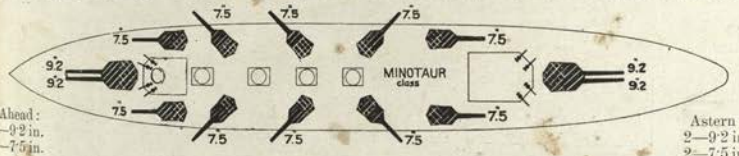
Normal displacement, 14,600 tons. Complement, 755.

h (*waterline*), 520 feet. Beam, 74½ feet. *Maximum* draught, 28 feet. Length *over all*, 525 feet (*p.p.* 490).
(But *Shannon* has 75½ feet beam and a foot less draught).

2 inch, XI., 50 cal. (*A*[3])
5 inch, II., 50 cal. (*A*)
pdr.
2—12 pdr. Field.
Torpedo tubes (18 inch):
5 *submerged*.

Armour (Krupp):-
6″ Belt (amidships) ..... *a*
4″ Belt (bow) ..... *d*
3″ Belt (stern) ..... *e*
1½″—¾″ Deck .....
Protection to vitals ..... = *aa*
7″ Barbettes ..... *a*
8″—6″ Turrets to these (K.C.) = *aa-a*
8″—6″ Secondary turrets ..... *aa-a*





Ahead:
2—9·2 in.
2—7·5 in.

Astern:
2—9·2 in.
2—7·5 in.

Broadside: 4—9·2 in., 5—7·5 in.

Machinery: 2 sets 4 cylinder. 2 screws. Boilers: Yarrow or Babcock. Designed H.P. 27,000 = 23 kts. Coal *normal* 1000 tons (only 950 in *Shannon*); *maximum* 2000 tons. Oil: 400 tons.

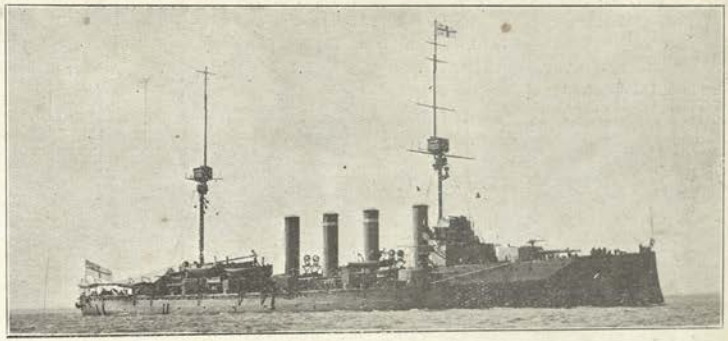
Gunnery Notes.—Loading positions, big guns: central pivot. Hoists, electric all guns. Guns hydraulically manœuvred. Weight of 9·2 guns, mountings and armour, 500 tons. Weight of 7·5 guns, mountings and armour, 1,573 tons.

Torpedo Notes.—1904 model torpedoes. Stern *submerged* tube.

Engineering Notes.—*n.d.* in *Minotaur*, *f.d.* in other two. 120 revolutions = about 21 kts.

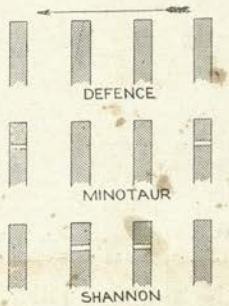
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Minotaur	Devonport	Harland & Wolff	Jan. 2,'05	Mar.'08	19,500 = 22·9	Babcock	23·1
Defence	Pembroke	Scotts S. & E. Co.	Feb.22,'05	1908	27,853 = 23	Yarrow	
Shannon	Chatham	Humphrys & T.	Jan. 2,'05	Mar.'08	28,128 = 22·41	Yarrow	21·5

General Notes.—Cost: *Minotaur*, £1,410,356; *Defence*, £1,362,970; *Shannon*, £1,415,535. Designed by Sir P. Watts. Built under 1904-5 Estimates. As designed, these ships had short funnels. The uptakes were heightened 15 feet in 1909. These ships are on the whole not so successful as the *Warrior* class.



SHANNON. *Photo, Symonds & Co.*

Differences.—*Minotaur* and *Defence* have signal bridge on level with the fore shelter deck, between fore mast and fore funnel; *Shannon* not. *Defence* has steam pipes either side of funnels; *Minotaur* has them in pairs abaft.



Note.—The *Minotaur* has not, at present, got any funnel markings, these having been removed for her commission on the China Station.

1904. BRITISH CRUISERS (22½ knot).

(Warrior Class—4 Ships.)

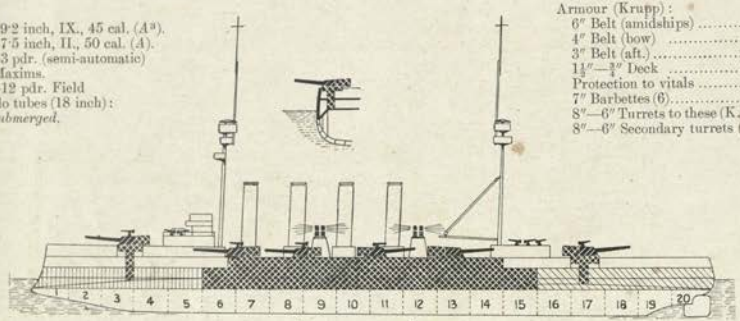
ACHILLES (June, 1905), **COCHRANE** (May, 1905), **NATAL** (Sept., 1905) & **WARRIOR** (Nov., 1905).

Displacement, 13,550 tons. Complement, 704.

Length (*p.p.*), 480 feet. Beam, 73½ feet. *Maximum* draught, 27½ feet.

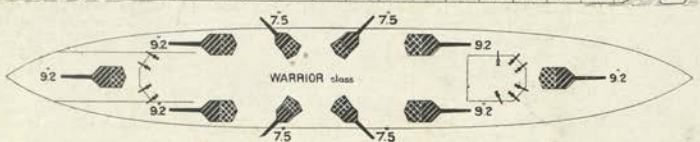
Guns:
6—9·2 inch, IX., 45 cal. (*A*[a]).
4—7·5 inch, II., 50 cal. (*A*).
24—3 pdr. (semi-automatic)
4 Maxims.
1—12 pdr. Field
Torpedo tubes (18 inch):
3 *submerged*.

Armour (Krupp):
6" Belt (amidships) ..... *a*
4" Belt (bow) ..... *d*
3" Belt (aft.) ..... *e*
1¼"—¾" Deck .....
Protection to vitals ..... = *a*
7" Barbettes (6) ..... *d*
8"—6" Turrets to these (K.C.) = *aa-a*
8"—6" Secondary turrets (4) = *aa-a*



Ahead: 3—9·2 in.

Astern: 3—9·2 in.



Broadside: 4—9·2 in., 2—7·5 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 19 Yarrow large tube and 6 cylindrical. Designed H.P. 23,500 = 22·33 kts. (but 24 kts. hoped for). Coal, *normal* 1,000 tons; *maximum* 2,000 tons. Also 400 tons of oil.

Armour Notes.—Thick part of belt 300 feet long. Armour deck made of two thicknesses of ¾" steel.

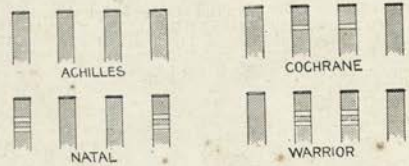
Gunnery Notes.—Loading positions, big guns: central pivot. Hoists, hydraulic and hand. 9·2 and 7·5 manœuvred, hydraulically and hand. Arcs of fire: End 9·2 in.—285°; Broadside 9·2 in.—120°; 7·5 in.—about 110°.

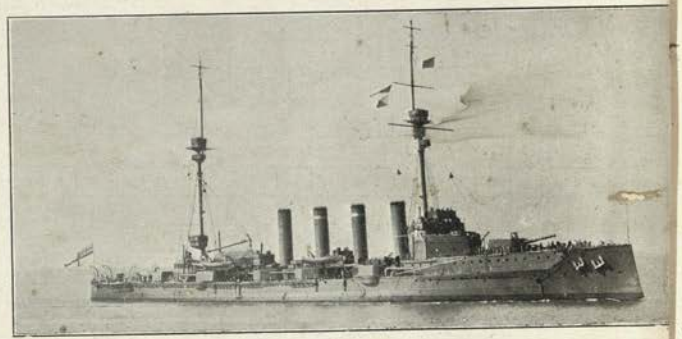
Torpedo Notes.—1904 model torpedoes. *Submerged* stern tubes.

Engineering Notes.—Machinery all standardized. Weight complete, 2250 tons. These ships burn about 23½ tons an hour at full power, about 15 tons an hour at 21 knots.

Name.	*Builders*	*Machinery and Boilers made by*	*Laid down.*	*Completed*	*Trials:—* 4/5 *P.* (126 *R.*)	*Full p.* (139 *R.*)	*Boilers.*	*Present best speed.*
Achilles	Elswick	Hawthorn Leslie	22 Feb., '04	1907	16,009 = 21·5 (*max.*)	23,968 = 23·27 (*max.*)	Yarrow & Cyl.	23
Cochrane	Fairfield	Fairfield	24 Mar., '04	1907	"	"	"	23·8
Natal	Vickers	Vickers	6 Jan., '04	1907	15,937 = 21·35	23,344 = 22·4	"	23·1
Warrior	Pembroke	Wallsend Co.	5 Nov., '03	1907-08	"	= 22·9	"	22·9

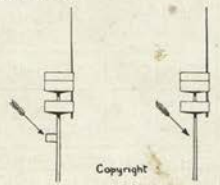
General Notes.—Design altered since first conception. These were originally to have been sisters to the *Duke of Edinburgh*. Average cost per ship about £1,180,000. Designer: Sir P. Watts. Built under 1903-4 estimates. These ships are singularly successful sea boats, and are held by all who have served in them to be the best cruisers ever turned out.





COCHRANE. *Photo, Symonds & Co.*

Differences—



ACHILLES. COCHRANE. WARRIOR. NATAL.

1903 BRITISH CRUISERS (22½ knot).

(Duke of Edinburgh Class—2 Ships).

DUKE OF EDINBURGH (June 1904), & BLACK PRINCE (November, 1904).

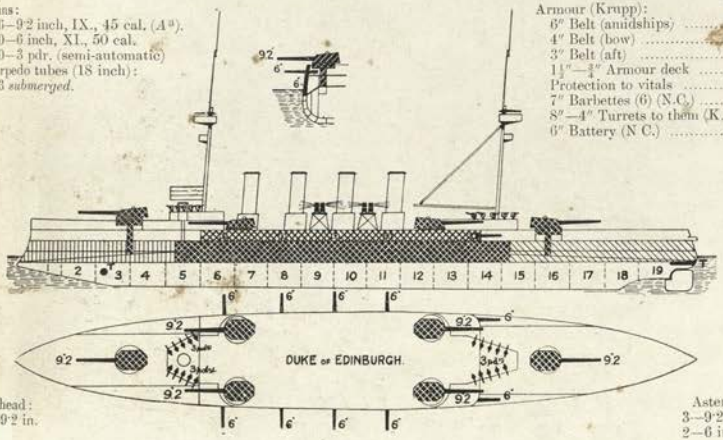
Normal displacement, 13,550 tons. Complement, 704.

Length (*p.p.*), 480 feet. Beam, 73½ feet. *Maximum* draught, 27½ feet.

Guns:
6—9·2 inch, IX., 45 cal. (A^{a}).
10—6 inch, XI., 50 cal.
20—3 pdr. (semi-automatic)
Torpedo tubes (18 inch):
3 *submerged*.

Armour (Krupp):

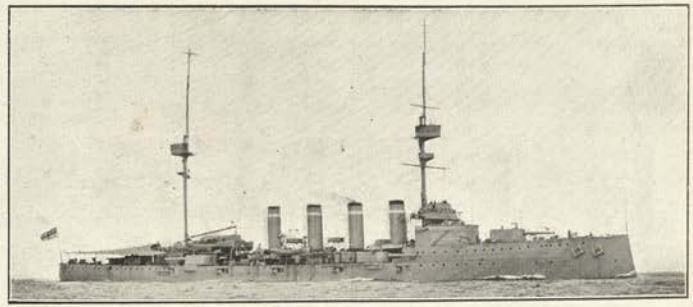
6″ Belt (amidships)	*a*
4″ Belt (bow)	*d*
3″ Belt (aft)	*e*
1½″—¾″ Armour deck	
Protection to vitals	= *a*
7″ Barbettes (6) (N.C.)	*a*
8″—4″ Turrets to them (K.C.)	= *aaa-a*
6″ Battery (N C.)	*b*



Ahead:
3—9·2 in.

Astern:
3—9·2 in.
2—6 in.

Broadside: 4—9·2 in., 5—6 in.



Photo, Symonds & Co.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 20 Babcock and Wilcox+6 cylindrical. Designed H.P. 23,500=22·33 kts. Coal: *normal* 1000 tons; *maximum* 2000 tons; also 600 tons oil.

Gunnery Notes.—Loading positions, big guns: central pivot. Hoists: hydraulic for 9·2 inch; electric for 6 inch guns. Big guns manœuvred hydraulically and hand.
Arcs of fire: End, 9·2, 285°; Beam, 9·2, 120°; Battery guns, about 120°.

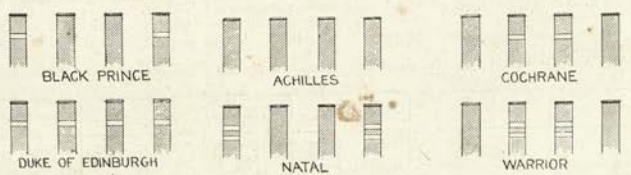
Torpedo Notes.—1904 model torpedoes. *Submerged* stern tube. Nets to be fitted.

Engineering Notes.—Standardised machinery. Weight 2250 tons complete. The *Duke of Edinburgh* is usually the better steamer of the two.

Name	*Builder*	*Engines and boilers*	*Laid down*	*Completed*	*Trials:— 30 hours at 1/5 8 hours full*		*Boilers*	*Last recorded best speed*
Duke of Edinburgh	Pembroke	Hawthorne Leslie	Feb., '03	Dec., '05	16,908=21·1	23,685=22·84	Babcock & Cyl.	23·1
Black Prince[a]	Thames I.W.	Thames I.W.	June, '03	Jan., '06	16,699=21·6	23,939=23·66[a]	Babcock & Cyl.	20·5

[a] Bad weather.

General Notes.—Estimates, 1902-3. Cost, per ship, about £1,150,000. Designed by Sir P. Watts. Not very good sea boats. The 6 inch guns cannot be fought in a sea-way.



1902 BRITISH CRUISERS (22 knot).

DEVONSHIRE CLASS—6 SHIPS.)

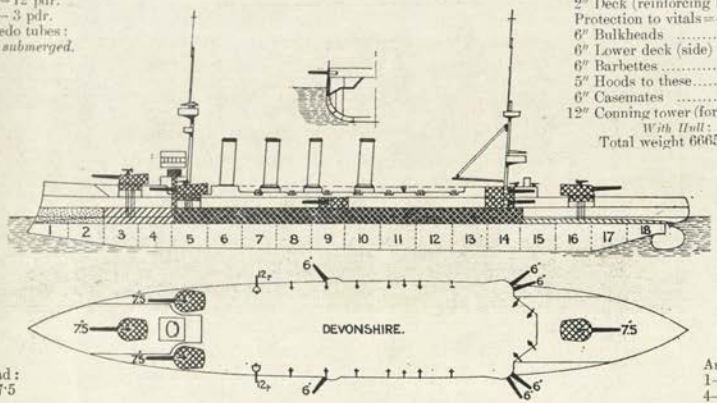
HAMPSHIRE (Sept., 1903). **CARNARVON** (Oct., 1903). **ANTRIM** (Oct., 1903). **ROXBURGH** (Jan., 1904). **ARGYLL** (March, 1904) & **DEVONSHIRE** (April, 1904).

Displacement, 10,850 tons. Complement, 655.

Length (*p.p.*), 450 feet. Beam, 68½ feet. *Maximum* draught., 25½ feet.

Guns:
4—7·5 inch I. (*B*).
6—6 inch VII.
2—12 pdr.
20—3 pdr.
Torpedo tubes:
2 *submerged*.

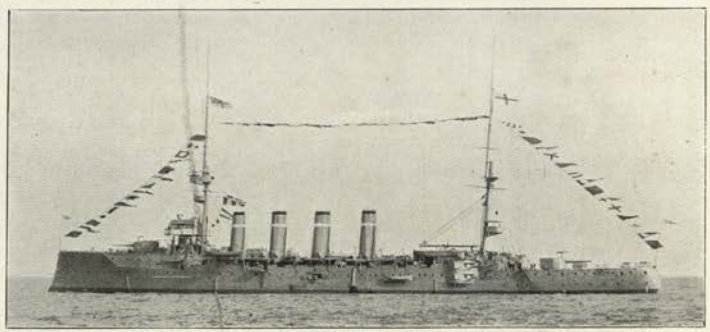
Armour (Krupp):
6" Belt (amidships) ..... *a*
2" Belt (forward) ..... *f*
2" Deck (reinforcing belt) ...
Protection to vitals = *aa* (barely).
6" Bulkheads ..... *a*
6" Lower deck (side) ..... *a*
6" Barbettes ..... *b*
5" Hoods to these ..... *b*
6" Casemates ..... *b*
12" Conning tower (fore) ..... *aaa*
With Hull:
Total weight 6665 tons.



Ahead:
3—7·5

Astern:
1—7·5
4—6 in.

Broadside: 3—7·5 in.; 3—6 in.



Machinery: 2 sets vertical triple expansion. 2 screws. Boilers, various: 17-15 water-tube and 6 cylindrical. Designed H.P. 21,000 = 22·25 kts. Coal: *normal* 800 tons; *maximum* 1,800 tons.

Armour Notes.—Belt is 10½ feet wide by 325 feet long from bow. Lower edge is full thickness.

Gunnery Notes.—Loading positions, big guns: central pivot. Hoists, electric and hand. Big guns manœuvred hydraulically.

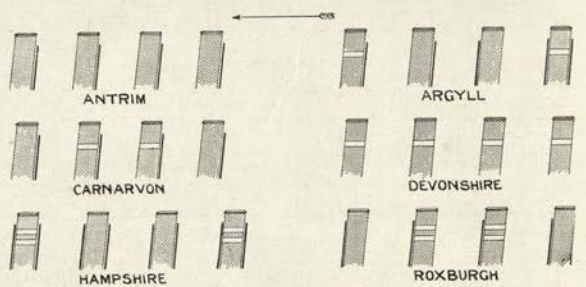
Engineering Notes.—Working pressure about 200. Heating surface, about 55,000 sq. feet. Grate area about 1,500 sq. feet.

Name.	*Built at*	*Laid down.*	*Completed.*	*Trials:— 30 hours at 4/5.*	*8 hrs. full power.*	*Boilers 4/5.*	*Last best speed.*
Devonshire	Chatham	March, '02	'04	14,830 = 21·0	21,475 = 22·97	15 Niclausse	23·1
Antrim	Clydebank	Aug., '02	'05	14,628 = 21·21	21,604 = 23·20	17 Yarrow	22·4
Argyll	Greenock FoundryCo.	Sept., '02	'05	15,108 = 20·8	21,190 = 22·28	16 Babcock	21·7
Carnarvon	Beardmore	Oct., '02	'04	15,212 = 21·43	21,489 = 23·3	17 Niclausse	22·1
Hampshire	Elswick	Sept., '02	'05	14,445 = 21·47	21,508 = 23·4	17 Yarrow	22·4
Roxburgh	London and Glasgow	June, '02	'05	15,005 = 21·54	21,875 = 23·63	17 Dürr	19·8

(Engines by builders, except for *Devonshire*, which are by Thames Ironworks.)

The coal consumption is heavy in all this class.

General Notes.—Cost, per ship, about £850,000. Estimates, '02—'03.



1900 BRITISH CRUISERS (23-24 knot).

(Monmouth Class—9 Ships). ("County Class")

KENT (Mar., 1901), **ESSEX** (Aug., 1901), **MONMOUTH** (Nov. 1901), **LANCASTER** (Mar., 1902), **BERWICK** (Sept., 1902), **DONEGAL** (Sept., 1902), **CORNWALL** (Oct., 1902), **CUMBERLAND** (Dec., 1902), & **SUFFOLK** (Jan., 1903).

Normal displacement, 9,800 tons. Complement, 678.

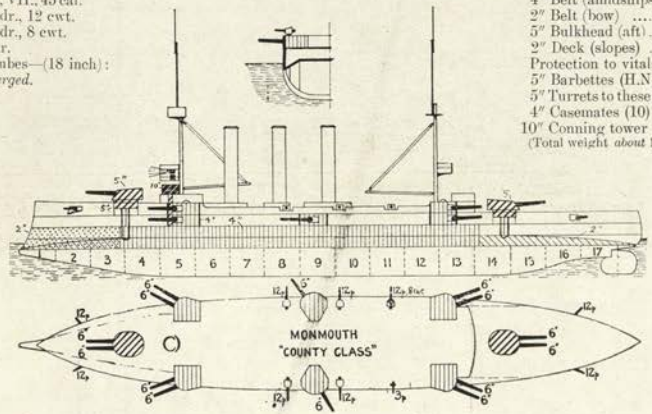
Length (*waterline*), 440 feet. Beam, 66 feet. *Mean* draught, 24½ feet. Length *over all*, 448 feet.

Guns:
14—6 in., VII., 45 cal.
8—12 pdr., 12 cwt.
1—12 pdr., 8 cwt.
3—3 pdr.
Torpedo tubes—(18 inch):
2 *Submerged*.

Armour—(Krupp):

4″ Belt (amidships)	*d*
2″ Belt (bow)	*f*
5″ Bulkhead (aft)	*b*
2″ Deck (slopes)	
Protection to vitals	= *c*
5″ Barbettes (H.N.)	*d*
5″ Turrets to these (H.N.)	= *c*
4″ Casemates (10)	*d*
10″ Conning tower	*aa*

(Total weight *about* 1,800 tons).



Ahead: 6—6 in.

Astern: 6—6 in.

Broadside: 9—6 in.

Machinery: 2 sets 4 cylinder vertical triple expansion. 2 screws. Boilers: Various—see *Notes*.
Designed H.P. 22,000 = 23 kts. Coal: *normal* 800 tons; *maximum* 1,600 tons; also 400 tons oil.

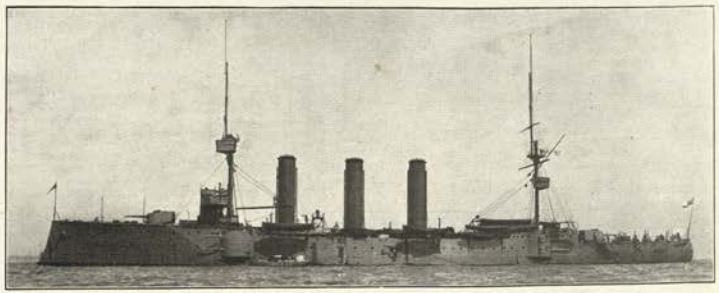
Armour Notes—Belt is 11½ feet wide by 330 feet long from bow; 5 feet of it below waterline.

Gunnery Notes.—Hoists: electric. The twin turrets do not give satisfaction, and a project for replacing them with 7·5's has been mooted. Fire control stations fitted 1907. One 12 pdr., 8 cwt. removed 1906-07. Twin turrets electrically manœuvred. Arcs of fire: Turrets, 240°; casemates, 120°.

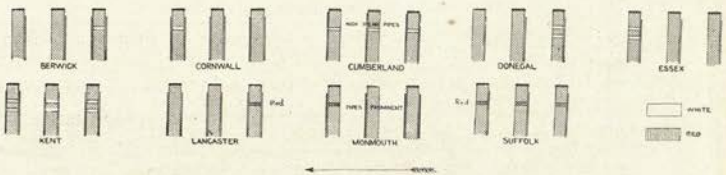
Engineering Notes.—About 147 revs.=full speed. Heating surface about 54,000 sq. feet. Grate area about 1,623 sq. feet.

Name.	*Built at*	*Machinery*	*Laid down.*	*Completed*	*30 hrs. 4/5.*	*8 hours full power.*	*Boilers.*	*Last recorded best speed*
Essex	Pembroke	Clydebank	Jan., '00	1903	16,132=19·6	22,219=22·8	Belleville	22
Kent	Portsmouth	Hawthorn	Feb., '00	1903	16,209=20·4	22,219=21·7	Belleville	24·1
Monmouth	L. & Glasgow	L. & Glasgow	Aug., '99	1903	16,326=20·4	22,189=22·6	Belleville	23·9
Lancaster	Elswick	Hawthorn L.	Mar., '01	1904	16,004=22·0	22,881=24	Belleville	24·1
Berwick	Beardmore	Humphrys	Apl., '01	1905	16,554=21·7	22,680=23·7	Niclausse	24·4
Donegal	Fairfield	Fairfield	Feb., '01	1905	16,333=22·3	22,154=23·7	Belleville	24·3
Cornwall	Pembroke	Hawthorn	Mar., '01	1904	16,487=21·8	22,694=23·6	Babcock	24·0
Cumberland	L. & Glasgow	L. & Glasgow	Feb., '01	1904	16,472=22·1	22,784=23·7	Belleville	24·4
Suffolk	Portsmouth	Humphrys & T.	Mar., '02	1904	16,350=21·2	22,645=23·7	Niclausse	23·7

General Notes.—Cost about £775,000 each. First of class laid down 1900. *Essex* is the worst ship of the class, drawing a foot over the design. All the others float normally. *Bedford*, of this class, was wrecked 1910, on the China Station.



Note.—The *Suffolk* only, is fitted with a stern walk.



1898 BRITISH CRUISERS (24 knot).

(Drake Class—4 Ships.)

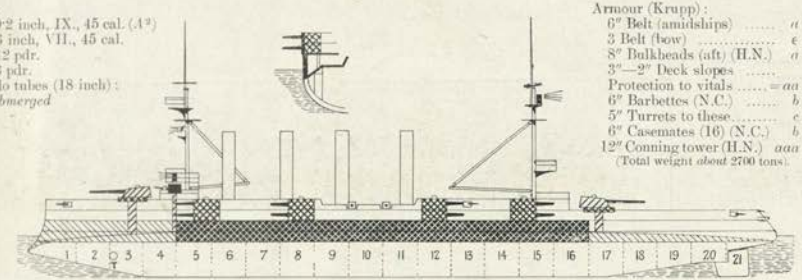
GOOD HOPE (February, 1901), **DRAKE** (March, 1901), **LEVIATHAN** (July, 1901) and **KING ALFRED** (Oct., 1901).

Displacement, 14,100 tons. Complement, 900.

Length (*waterline*), 515 feet. Beam, 71 feet. *Maximum* draught, 28 feet. Length *over all*, 529½ feet.

Guns:
2—9·2 inch, IX., 45 cal. (A²)
16—6 inch, VII., 45 cal.
12—12 pdr.
3—3 pdr.
Torpedo tubes (18 inch):
2 *submerged*

Armour (Krupp):
6″ Belt (amidships) ..... *a*
3 Belt (bow) ..... *e*
8″ Bulkheads (aft) (H.N.) *a*
3″—2″ Deck slopes .....
Protection to vitals ..... = *aa*
6″ Barbettes (N.C.) ..... *b*
5″ Turrets to these ..... *c*
6″ Casemates (16) (N.C.) *b*
12″ Conning tower (H.N.) *aaa*
(Total weight *about* 2700 tons).



Broadside: 2—9·2 in., 8—6 in.

Machinery: 2 sets 4 cylinder vertical inverted triple expansion. 2 screws. Boilers: 43 Belleville. Designed H.P. 30,000 = 23 kts. Coal: *normal* 1250 tons: *maximum* 2500 tons.

Armour Notes—Belt is 11½ feet wide by 400 feet long.

Gunnery Notes—Loading positions, big guns: all round. Hoists, electric for 6 inch guns. Big guns manœuvred by hydraulic gear. Fire controls fitted 1905-06.

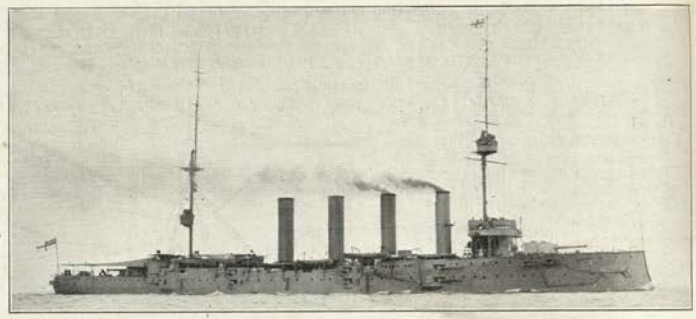
Engineering Notes—Machinery, boilers with water, &c., weigh 2,500 tons. Boiler rooms 185 feet long. All the class are excellent steamers. Heating surface, 72,000 square feet. Grate area, 2313 square feet.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials:— 30 hrs. at 4/5*	*Trials:— Full power*	*Boilers*	*Last recorded best speed*
Good Hope	Fairfield	Fairfield	Sept. '99	1902	22,703 = 22·7	31,071 = 23·05	Belleville	23·51
Drake	Pembroke	Humphrys & T.	Apl., '99	1902	25,103 = 22·08	30,849 = 23·05	Belleville	24·6
King Alfred	Clydebank	Clydebank	Nov. '99	1903	22,540 = 21·98	30,893 = 23·46	Belleville	25·1*
Leviathan	Vickers	Vickers	Aug. '99	1903	22,990 = 21·96	31,205 = 23·25	Belleville	23·7

* 1907. Mean for best hour. Mean of 8 hours was 24·8

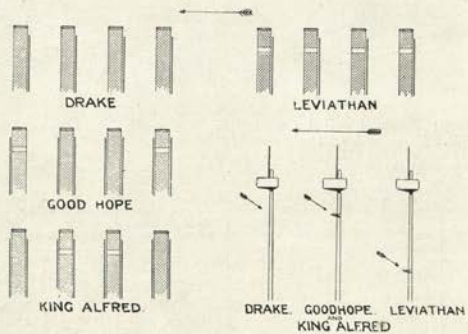
Coal consumption averages 11 tons an hour at 19 kts.; and 19-24 tons an hour at 30,000 H.P. (24 kts).

General Notes—Tactical diameter about 750 yards, extreme helm. Cost *complete* per ship averaged just over £1,000,000.



Drake. *Photo, Symonds & Co.*

Differences:—



Drake has Admiral's bridge forward. No after-bridge. All have now no yards on main mast.

1898 BRITISH CRUISERS (22 knot).

(Cressy Class.—6 Ships.)

SUTLEJ (November, 1899), **CRESSY** (December, 1899), **ABOUKIR** (May, 1900), **HOGUE** (August, 1900) **BACCHANTE** (February, 1901), & **EURYALUS** (May, 1901).

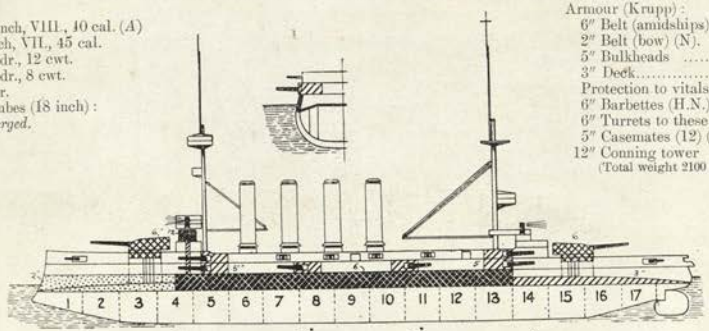
Displacement, 12,000 tons. Complement, 700 (flagship 745).

Length (*waterline*), 454 feet. Beam, 69½ feet. *Maximum* draught, 28 feet.

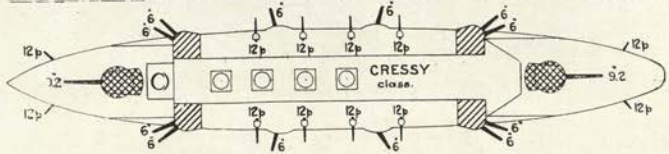
Guns:
2—9·2 inch, VIII., 40 cal. (*A*)
12—6 inch, VII., 45 cal.
12—12 pdr., 12 cwt.
1—12 pdr., 8 cwt.
3—3 pdr.

Torpedo tubes (18 inch):
2 *submerged*.

Armour (Krupp):
6″ Belt (amidships) ..... *a*
2″ Belt (bow) (N). ..... *f*
5″ Bulkheads ..... *b*
3″ Deck.....
Protection to vitals .....=*aa*
6″ Barbettes (H.N.) ..... *b*
6″ Turrets to these ..... *b*
5″ Casemates (12) (K.N.C.) *c*
12″ Conning tower ..... *aaa*
(Total weight 2100 tons).



Ahead:
1—9·2 in.
4—6 in.



Astern:
1—9·2 in.
4—6 in.

Broadside: 2—9·2 in., 6—6 in.

Machinery: 2 sets 4 cylinder vertical inverted triple expansion. 2 screws. Boilers: 30 Belleville. Designed H.P. 21,000=21 kts. Coal: *normal* 800 tons; *maximum* 1600 tons.

Armour Notes.—Belt is 11½ feet wide by 230 feet long, 5 feet of it below water.

Gunnery Notes.—Loading positions, big guns: all round (central pivot). Hoists: Electric for 6 inch guns. Big guns manœuvred by hydraulic gear. Fire control platforms fitted 1905-06.

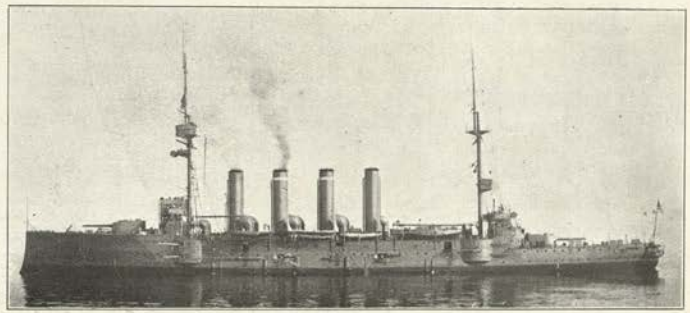
Engineering Notes.—Used to be very good steamers, but now getting worn out, and only good for short spurts. Machinery weighs 1800 tons. Boiler space 130 feet.

Name.	*Builder.*	*Machinery and Boilers by*	*Laid down.*	*Completed*	*First Trials. 30 hours at 4/5 114 revs.*	*8 hours full power 122 revs.*	*Boilers.*	*Best recent speed.*
Sutlej	Clydebank	Clydebank	Aug., '98	1902	16,604=20·62	21,261=21·77	Belleville	17·9
Cressy	Fairfield	Fairfield	Oct., '98	1901	16,800=20·50	21,200=20·79	Belleville	19·2
Aboukir	Fairfield	Fairfield	Nov., '98	1902	16,274=20·40	21,352=21·6	Belleville	18·6
Hogue	Vickers	Vickers	July, '98	1902	16,456=20·15	22,065=22·1*	Belleville	17
Bacchante	Clydebank	Clydebank	Dec., '99	1902	16,446=20·60	21,520=21·75	Belleville	19·5
Euryalus	Vickers	Vickers	July, '99	1903		21,318=21·63	Belleville	20·3

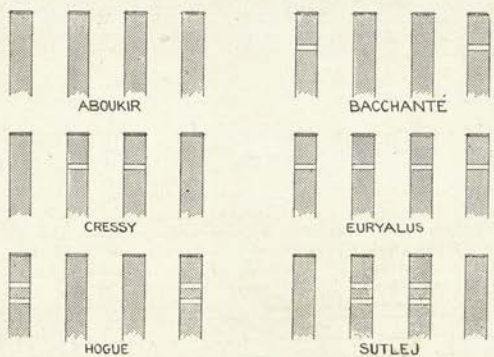
* Run in bad weather.

Coal consumption: at 21,000 H.P. is now about 18-19 tons an hour; at 16,000 H.P. about 13 tons an hour.

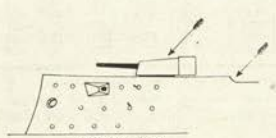
General Notes.—Tactical diameter about 700 yards. Non-flammable wood fittings. Hull with armour weighs 7840 tons. Cost complete just under £800,000.

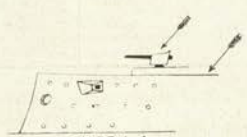


Photo, Symonds & Co.



Sutlej has windsails instead of cowls.





Copyright

1895 BRITISH CRUISERS (21 knot.)

(Diadem Class).

DIADEM (October, 1896), **EUROPA** (March, 1897), **ARGONAUT** (January, 1898), **ARIADNE** (April, 1898), **AMPHITRITE** (July, 1898), **SPARTIATE** (October, 1898).

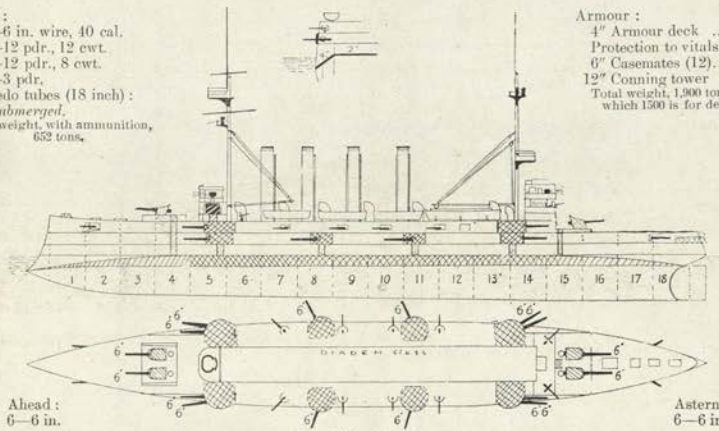
(*Niobe* of this class, *see* Canada).

Displacement, 11,000 tons. Complement, 677.

Length (*waterline*), 450 feet. Beam, 69 feet. *Maximum* draught, 27½ feet. Length *over all*, 462½ feet.

Guns:
16—6 in. wire, 40 cal.
12—12 pdr., 12 cwt.
1—12 pdr., 8 cwt.
3—3 pdr.
Torpedo tubes (18 inch):
2 *submerged*.
Total weight, with ammunition, 652 tons.

Armour:
4″ Armour deck .....= *b*
Protection to vitals ...= *b*
6″ Casemates (12)..... *b*
12″ Conning tower ...*aaa*
Total weight, 1,900 tons, of which 1500 is for deck.



Ahead: 6—6 in.

Astern: 6—6 in.

Broadside: 8—6 in.

Machinery: 2 sets 4 cylinder vertical inverted triple expansion. 2 screws. Boilers: 30 Bellevilles. Designed H.P. 16,500=20·25 in earlier three; 18,000=20·75 in later four. Coal: *normal* 1000 tons; *maximum* 2000 tons; 400 tons oil also to be carried.

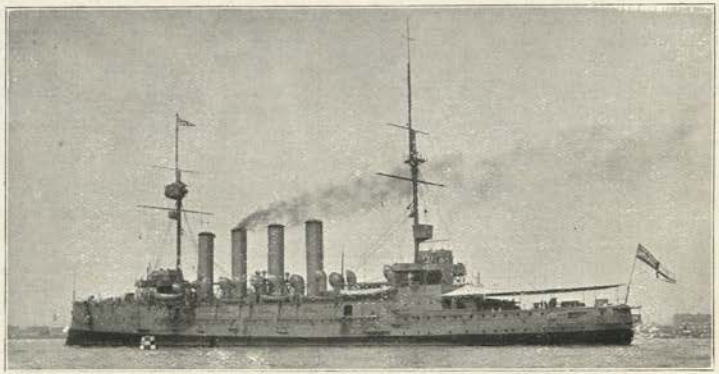
Gunnery Notes.—Each gun has its own hoist. Electric hoists. Ammunition carried: 200 rounds per gun.

Engineering Notes.—Machinery weighs 1525 tons. Boiler space 132 feet. Heating surface 47,282 square feet. Grate area 1390 feet. Boilers of last four ships are of an improved pattern to those in the three earlier.

Name	*Builder*	*Machinery and Boilers by*	*Laid down*	*Completed*	*Trials*: *30 hours at 4/5.*	*8 hours full.*	*Boilers*	*Best recent speed*
								kts.
Argonaut	Fairfield	Fairfield	Nov.'96	1900	13,815=19·86	18,894=21·17	Belleville	
Ariadne	Clydebank	Clydebank	Oct.'96	1900	14,046=20·1	19,156=21·50	Belleville	about
Amphitrite	Vickers	Vickers	Dec.'96	1900	13,695=19·5	18,229=20·78	Belleville	18-19
Spartiate	Pembroke	Maudslay	May'97	1902		18,658=21	Belleville	
Diadem	Fairfield	Fairfield	Jan.'96	1899	12,791=19·8	17,262=20·65	Belleville	about
Europa	Clydebank	Clydebank	Jan.'96	1899	12,739=19·5	17,137=20·4	Belleville	18-17

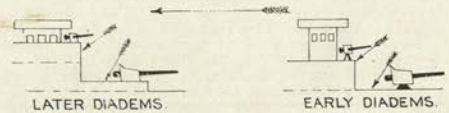
Coal consumption is now heavy in all this class. All are getting worn out.

General Notes.—Hull with armour weighs 6975 tons. Tactical diameter about 1000 yards. Average cost per ship, about £600,000. *Niobe* of this class sold to Canada. *Andromeda* struck off effective list. *Argonaut* is used for training stokers.

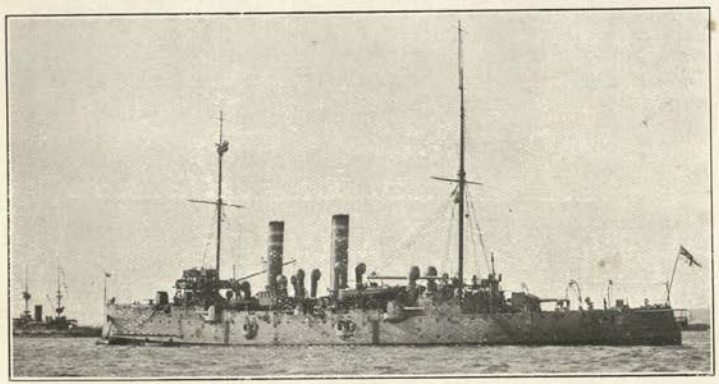


Photo, Symonds.

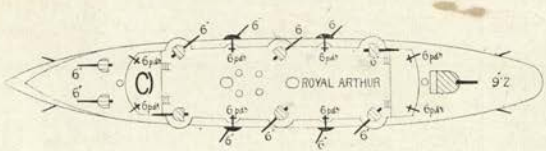
Differences.—

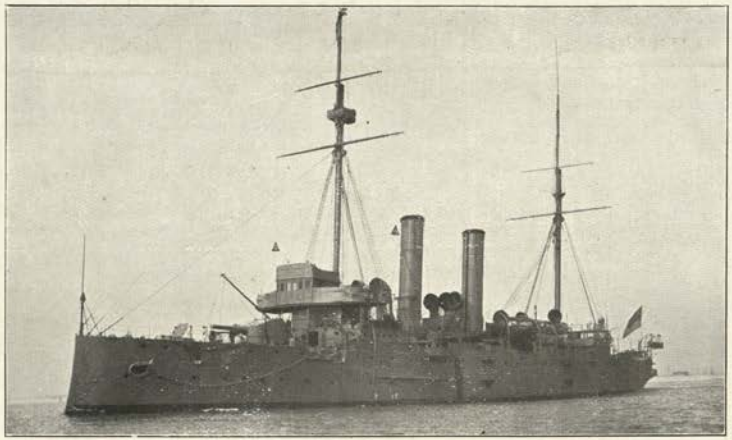


Distinction.—From *Cressy* class by being generally "lighter" in appearance, and the absence of large fore and aft turrets.



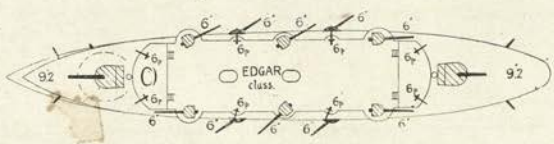
ROYAL ARTHUR (1891) and **CRESCENT** (1892). 7700 tons. Armament: 1—9·2 inch, 30 cal., 12—6 inch, VII (of which four are in 6″ casemates on main deck, others shields), 12—6 pdr., 5—3 pdr., 2 boat, 2—18 inch *submerged* tubes. Designed H.P. 12,000=19·5 kts. Coal: *maximum* 1250 tons. Still steam very well.

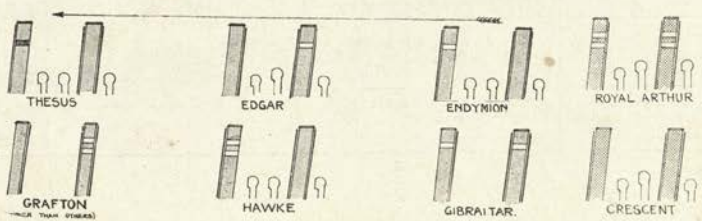




EDGAR (1890), **HAWKE** (1891), **ENDYMION** (1891), **THESEUS** (1892), **GRAFTON** (1892) and **GIBRALTAR** (1892). 7350 tons (except *Gibraltar*, which is sheathed and coppered, 7700 tons). Armament: 2—9·2 inch, 30 cal., 10—6 inch VII (four in 6″ main deck casemates, others shields), 12—6 pdr., 5—3 pdr., 2—18 inch *submerged* tubes. Armour: 5″—3″ deck. Designed H.P. 12,000=19·5 kts. Coal: *maximum* 1250 tons. Excellent steamers.

St. George, of this class, is a torpedo depôt ship. The *Hawke* lost her ram in collision with the S.S. *Olympic* in 1911 and has now a straight stem.





1913 BRITISH LIGHT CRUISERS. **1912**

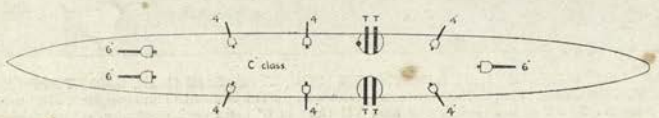
CALLIOPE (——), *CAROLINE* (——), *CARYSFORT* (——), *CHAMPION* (——), *CLEOPATRA* (——), *COMUS* (——), *CONQUEST* (——), *CORDELIA* (Feb., 1914).

Displacement, *about* 3800 tons. Complement, .

Length, feet. Beam, feet. Draught, feet. Length *over all*, feet.

Guns:
3—6 inch
6—4 inch
Torpedo tubes (21 inch):
4 *above water*

Armour:
2½″ Belt (amidships)



Machinery: Turbine. Boilers: Fuel: Oil only, tons.

Designed H.P. =30 kts.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Boilers*	*Best recent speed*
Calliope	Chatham	...	'14					
Caroline	Cammell-Laird	Cammell-Laird	'13					
Carysfort	Pembroke	...	Feb.'14					
Champion	Hawthorn	Hawthorn	'14					
Cleopatra	Devonport	...	Feb.'14					
Comus	Swan, Hunter	Wallsend	'14					
Conquest	Chatham	...	'14					
Cordelia	Pembroke	...	July,'13					

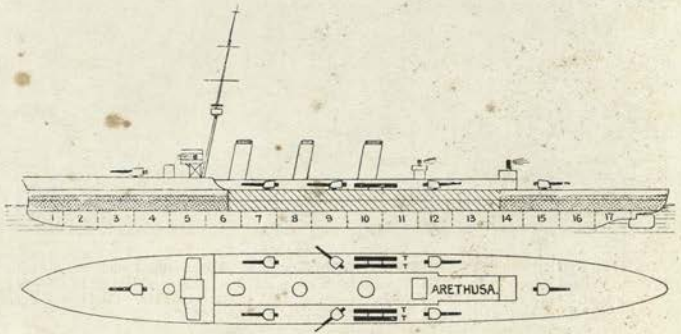
ARETHUSA (Oct., 1913), **AURORA** (Sept., 1913), **GALATEA** (1914), **INCONSTANT** (1914), **ROYALIST** (1914), **PENELOPE** (1914), **PHAETON** (1914), **UNDAUNTED** (1914).

Displacement, 3520 tons. Complement, .

Length, 450 feet. Beam, feet. Draught, feet. Length *over all*, feet.

Guns:
2—6 inch
6—4 inch
Torpedo tubes (21 inch):
4 *above water*

Armour:
2½″ Belt
″ Deck



Machinery: Turbine (see *Notes*). Boilers: Yarrow in all. Designed H.P. 30,000=30 kts Fuel: Oil, tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Boilers*	*Best recent speed*
Arethusa	Chatham	Fairfield	Oct.'12	June'14	=	Brown-Curtis	Yarrow small tube in all	
Aurora	Devonport	Parsons	Oct.'12	June'14	=	Brown-Curtis		
Galatea	Beardmore	Beardmore	Dec.'12	'14	=	Parsons		
Inconstant	Beardmore	Beardmore	Dec.'12	'14	=	Parsons		
Royalist	Beardmore	Beardmore	Dec.'12	'14	=	Parsons		
Penelope	Vickers	Vickers	Dec.'12	'14	=	Parsons		
Phaeton	Vickers	Vickers	Dec.'12	'14	=	Parsons		
Undaunted	Fairfield	Fairfield	Dec.'12	'14	=	Brown-Curtis		

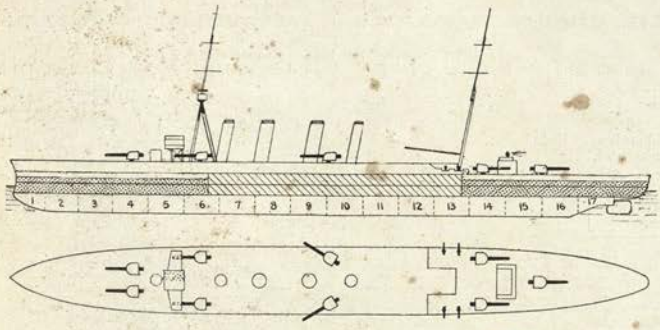
NOTTINGHAM (April, 1913), **BIRMINGHAM** (May, 1913), **LOWESTOFT** (April, 1913).

Displacement, 5400 tons. Complement,

Length (*p.p.*), 430 feet. Beam, 49⅞ feet. *Mean* draught, feet. Length *over all*, 450 feet.

Guns:
9—6 inch
4—3 pdr.
Torpedo tubes (21 inch):
2 *submerged*

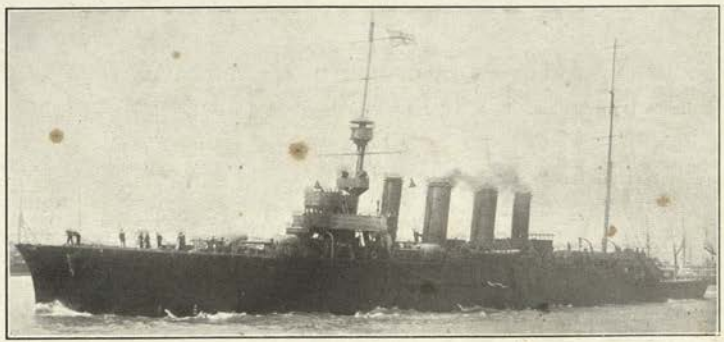
Armour:
2″ Deck (on slopes) .....
2″ Side (amidships) .....



Machinery: Parsons turbine, Boilers: Yarrow. Designed H.P. 22,000=24·75 kts. Coal: *normal* tons; *maximum* 650 tons. Also oil.

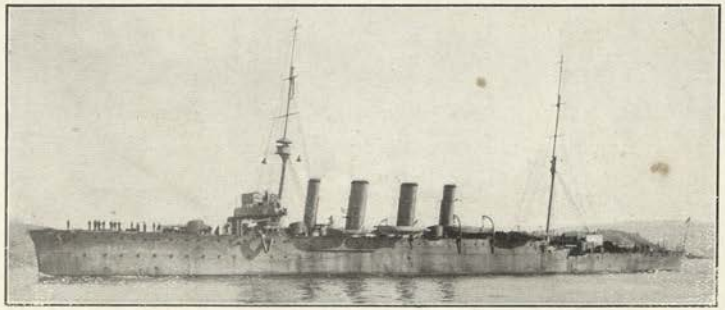
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Nottingham	Pembroke Y.	Hawthorn	June '12	'14	=	Yarrow	...
Birmingham	Elswick	...	'12	'14	=	Yarrow	...
Lowestoft	Chatham Y.	...	July, '12	'14	=	Yarrow	...

Belong to 1911-12 estimates.



Photo, Cribb.

Note.—*L.* and *N.* have a tripod fore mast.



Photo, Abrahams & Sons.

(Chatham Class—3 Ships.)

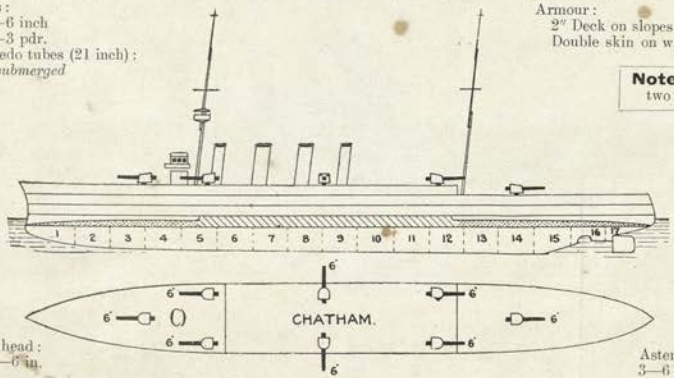
SOUTHAMPTON (May, 1912), **DUBLIN** (April, 1912), **CHATHAM** (Nov, 1911).

Displacement, 5400 tons. Complement, 380.

Length (*p.p.*), 430 feet. Beam, 48¾ feet. *Mean* draught, 15¼ feet. Length *over all*, 450 feet.

Guns:
8—6 inch
4—3 pdr.
Torpedo tubes (21 inch):
2 *submerged*

Armour:
2″ Deck on slopes
Double skin on waterline



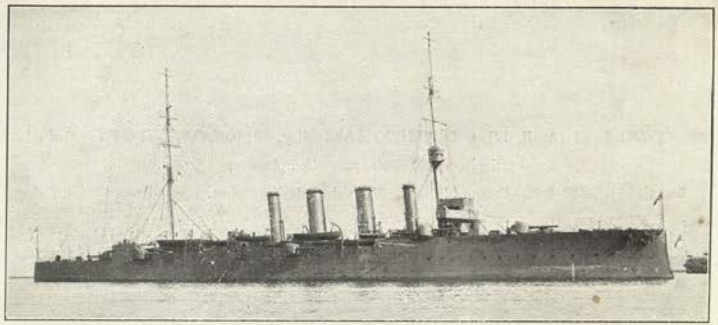
Ahead: 3—6 in.

Astern: 3—6 in.

Machinery: Curtis turbine in *Southampton*, 2 screws; others Parsons, 4 screws. Boilers: Yarrow.
Designed H.P. 22,000=25 kts Coal: *normal* 750 tons; *maximum* 1000 tons; also oil.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Southampton	Clydebank	Clydebank	Apl. '11	—'12		Yarrow in all.	
Dublin	Beardmore	Beardmore	Apl. '11	—'12			
Chatham	Chatham	Thames I.W.	Jan. '11	—'12			

Belong to 1910-11 Estimates.



(Weymouth Class—4 Ships).

WEYMOUTH (1910), **YARMOUTH** (1911), **FALMOUTH** (1910), **DARTMOUTH** (1911).

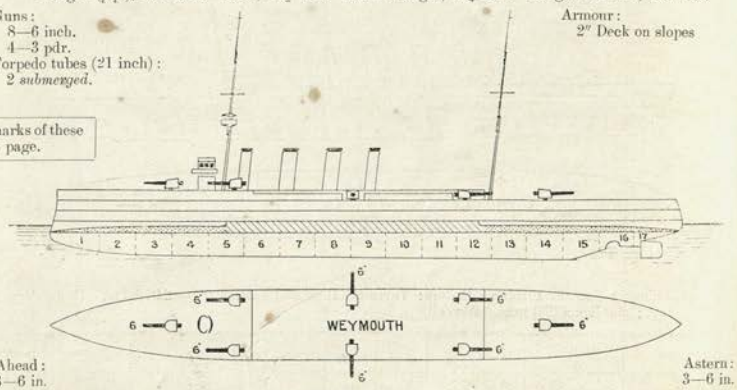
(Also others of this class: *see* Australia and Canada).

Displacement, 5250 tons. Complement, 376.

Length (*p.p.*), 430 feet. Beam, 48½ feet. *Mean* draught, 15¼ feet. Length *over all*, 450 feet.

Guns:
8—6 inch.
4—3 pdr.
Torpedo tubes (21 inch):
2 *submerged*.

Armour:
2″ Deck on slopes



Ahead: 3—6 in.

Astern: 3—6 in.

Broadside: 5—6 inch.

Machinery: Parsons turbine. 4 screws. Except *Yarmouth*, Curtis, 2 screws. Boilers: Yarrow.
Designed H.P. 22,000=25 kts. Coal: *normal* 750 tons; *maximum* 1000 tons; also oil.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials* 30 *hrs. at* 3/4	*Trials* 8 *hrs. full power*	*Boilers*	*Best recent speed*
Dartmouth	Vickers	Vickers	Nov.'09	*To be*	18,839=24·95	23,467=25·90	Yarrow	
Falmouth	Beardmore	Beardmore	Nov.'09	1911	18,374=	26,311=27·01		
Weymouth	Elswick	Parsons Tur. Co.	Nov.'09		18,076=	23,532=25·60		
Yarmouth	London & Glas. Co.	L. & G. Co.	Nov.'09	—'12	=	24,000=26·00		

General Notes.—These four belong to the 1909-10 Estimates. Funnel markings: see next page.

Note.—For funnel marks of these two classes see next page.

1908 BRITISH LIGHT CRUISERS (25-26 knot).

(Bristol Class—5 Ships).

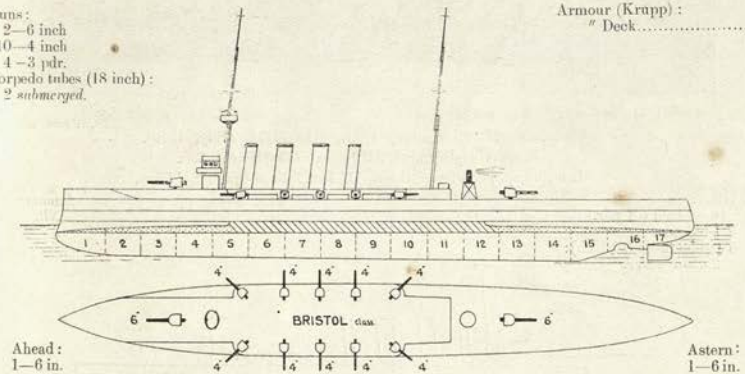
BRISTOL (Feb., 1910), **GLASGOW** (Sept., 1909), **GLOUCESTER** (Oct., 1909), **LIVERPOOL** (Oct., 1909), and **NEWCASTLE** (Nov., 1909).

Displacement, 4800 tons. Complement, 376.

Length (*p.p.*), 430 feet. Beam, 47 feet. *Mean* draught, 15¼ feet. Length *over all*, 453 feet.

Guns:
2—6 inch
10—4 inch
4—3 pdr.
Torpedo tubes (18 inch):
2 *submerged.*

Armour (Krupp):
" Deck.....



Ahead:
1—6 in.
2—4 in.

Astern:
1—6 in.
2—4 in.

Broadside: 2—6 inch, 5—4 inch.

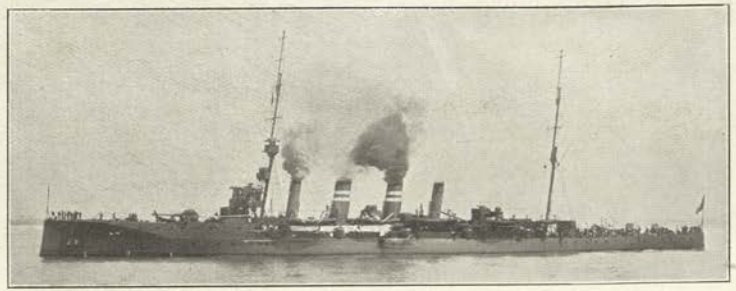
Machinery: Turbine, Parsons in all, 4 screws; except Curtis in *Bristol*, 2 screws. Boilers: 12 Yarrow, small tube. Designed H.P. 22,000 = 25 kts. Coal: *normal* 600 tons; *maximum* 750 tons.

Torpedo Notes.—2 searchlights.

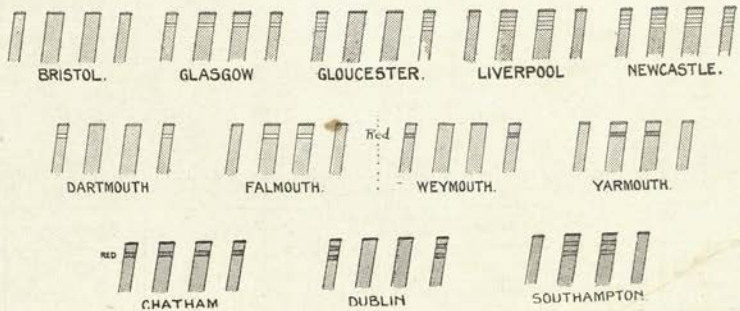
Engineering Notes.—Heating surface 50,000 sq. feet. Grate area: 900 sq. feet.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*		*Boilers*	*Best recent speed*
Bristol	Brown	Brown	Mar.'09	Feb.'11	19,130 = 25·17	24,529 = 26·84	Yarrow in all.	
Glasgow	Fairfield	Fairfield	Mar.'09	Jan.'11	14,055 = 23·7	22,472 = 26·7		
Gloucester	Beardmore	Beardmore	Apl.'09	Jan.'11	13,968 = 23·48	23,757 = 26·29		
Liverpool	Vickers	Vickers	Feb.'09	Oct.'10	18,824 = 25·10	24,614 = 26·17		
Newcastle	Elswick	Wallsend Co.	Mar.'09	Oct.'10	14,051 = 23·34	24,669 = 26·4		

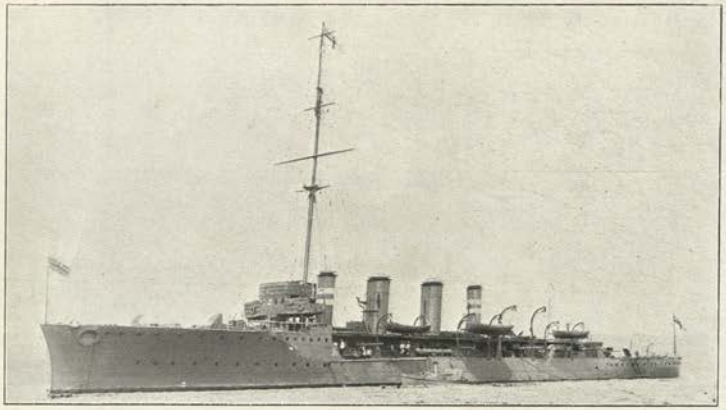
Built under the 1908-09 Estimates. Generally alluded to as the "Town" class.



Liverpool. *Photo, Symonds & Co.*



1910-11 BRITISH LIGHT CRUISERS.



ACTIVE (Feb., 1911), **AMPHION** (Dec., 1911), **FEARLESS** (June, 1912).
Displacement, 3440 tons. Complement, 320.
Length (*p.p.*), 385 feet. Beam, 41½ feet. *Mean* draught, 14 feet.

Guns:
10—4 inch (31 pdr.)
4—3 pdr.
Torpedo tubes (21 inch):
2 *above water*

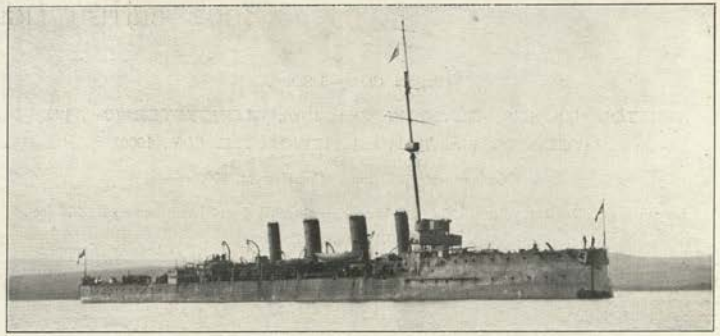
Armour:
Nil; but double skin amidships.

[Plan as *Blanche*, except for different shaped bow.]

Machinery: Parsons turbine. Boilers: Yarrow (small tube). Designed H.P. 18,000 = 25 kts. Coal: *normal* 350 tons; *maximum* tons. Also 100 tons oil.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Active	Pembroke	Hawthorn	July, '10	1912	—	Yarrow in all	—
Amphion	Pembroke	Hawthorn	Mar., '11	1912	= 25·4		27
Fearless	Pembroke	Hawthorn	Nov., '11	1913	—		—

1909 BRITISH LIGHT CRUISERS.

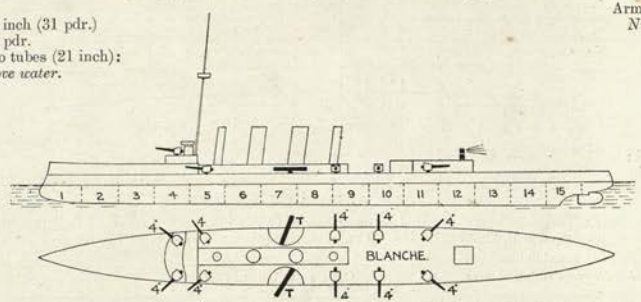


Photo, Abraham.

BLANCHE (November, 1909), **BLONDE** (July, 1910).
Normal displacement, 3350 tons. Complement, 320.
Length (*p.p.*), 385 feet. Beam, 41½ feet. *Mean* draught, *14* feet.

Guns:
10—4 inch (31 pdr.)
4—3 pdr.
Torpedo tubes (21 inch):
2 *above water*.

Armour:
Nil.



Machinery: Parsons' turbine. Boilers: 12 Yarrow. Designed H.P. 18,000 = 25 kts. Coal: *normal*, 450 tons; *maximum*, tons. Oil, 100 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials* 30 *hrs.*	*Trials* 8 *hrs.*	*Boilers*	*Best recent speed*
Blanche	Pembroke, Y.	Hawthorn	Ap. '09	1910	15,000 = 22·3	18,542 = 25·67	Yarrow small tube	26·1
Blonde	Pembroke, Y.	Laird	Dec. '09	1911		= 25		

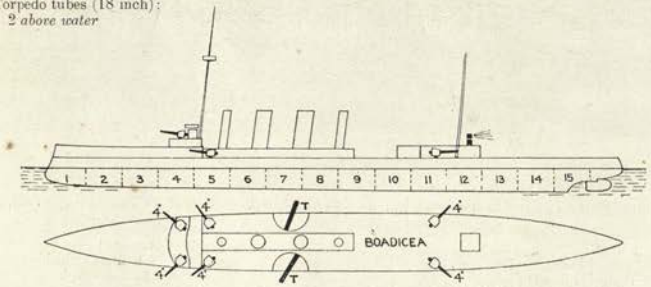
BOADICEA (May, 1908) & **BELLONA** (March, 1909).

Normal displacement, 3300 tons. Complement, 264.

Length (*p.p.*), 385 feet. Beam, 41 feet. *Mean* draught, 13½ feet.

Guns:
6—4 inch (31 pdr.)
4—3 pdr.
Torpedo tubes (18 inch):
2 *above water*

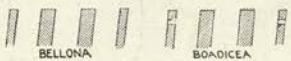
Armour:
Nil.

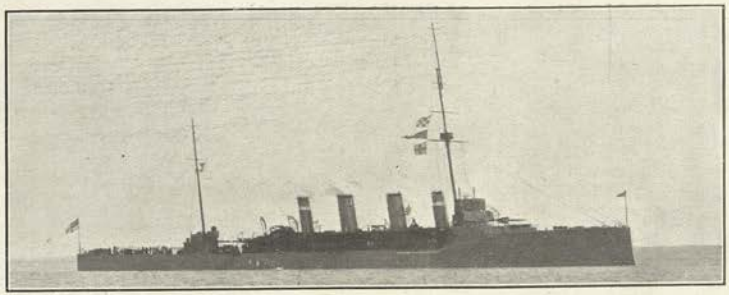


Machinery: Parsons turbine. Boilers: Yarrow. Designed H.P. 18,000 = 25 kts. Coal: *normal*, 450 tons; *maximum* tons. Oil, 100 tons.

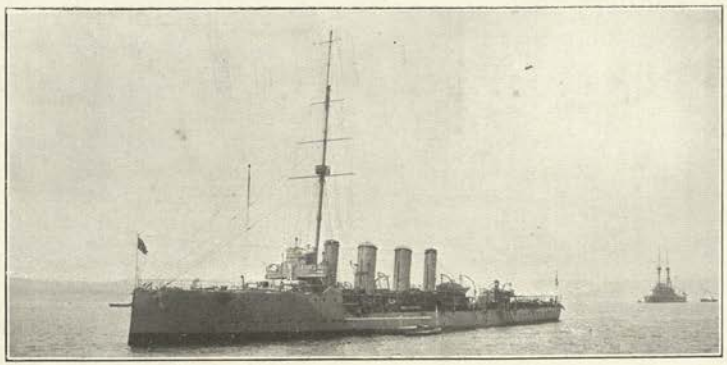
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials (mean)*	*Boilers*	*Best recent speed*
Boadicea	Pembroke Y	Clydebank	July '07	1909	14,000 = 25 20,000 = 25·9	Yarrow	27·9
Bellona	Pembroke Y	Fairfield	June '08	1910		Yarrow	28·2

Bellona made her 28·2 on measured mile with wind and tide. Against wind and tide she made 26·8.
Average cost: £330,000 *about*.



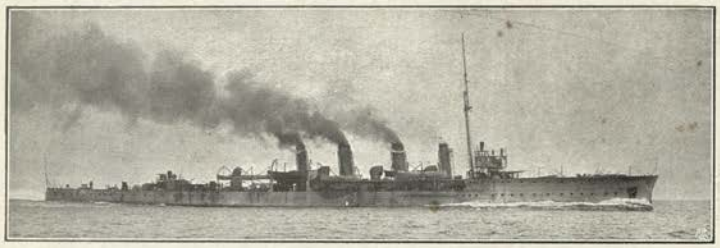


BOADICEA. Present rig. *Photo, Seeward.*



BELLONA. *Photo, Seeward.*

1903 BRITISH LIGHT CRUISERS (25 knot).



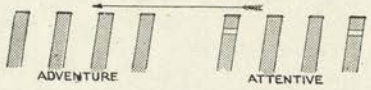
Photo, Elswick.

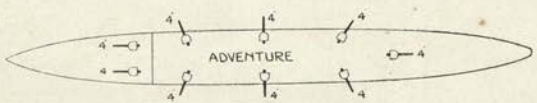
ADVENTURE (8th September, 1904), & **ATTENTIVE** (24th November, 1904).

Displacement, 2670 tons Length, 374 feet. Beam, 38½ feet. *Maximum* draught, 13¼ feet. Complement, 268.

Guns:
9—4 inch.
Torpedo tubes (14 inch)
2 *above water.*

Armour.
2″ Deck .....
¾″ Gun shields .....



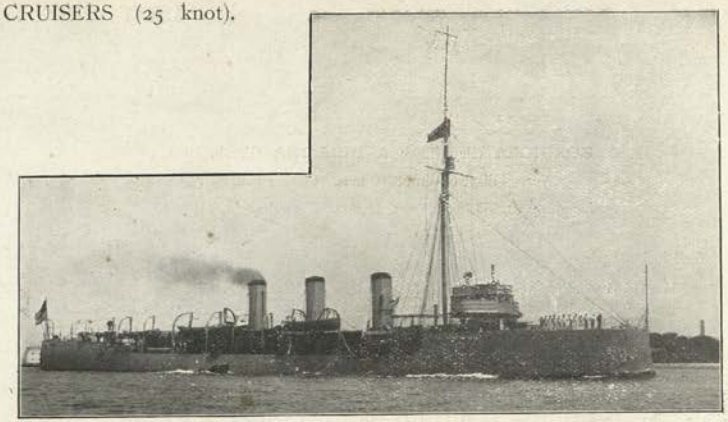


Machinery: 2 sets 6 cylinder. 2 screws. Boilers: ⅓ Yarrow curved, ⅔ cylindrical. Designed H.P. 16,000=25 kts. Coal: *normal* 150 tons; *maximum* 380 tons.

General Notes.—Built at Elswick. Engined by Hawthorn, Leslie & Co. Laid down January, 1904. Completed October, 1905. Average cost, £275,000.

First Trials.—Adventure, I.H.P. 15,850=25·42 kts. *Attentive*, 16,195=25·6. Designed H.P. 15,925=25 kts.

Distinctions.—4 funnels



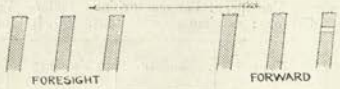
Photo, Symonds & Co.

FORWARD (29th August, 1904), & **FORESIGHT** (8th October, 1904).

Displacement, 2850 tons. Length, 360 feet. Beam, 39 feet. *Maximum* draught, 14 feet. Complement, 268.

Guns:
9—4 inch
Torpedo tubes (14 in.)
2 *above water.*

Armour:
2″ Belt amidships ...
1½″—⅝″ Deck .....



[*As Adventure.*]

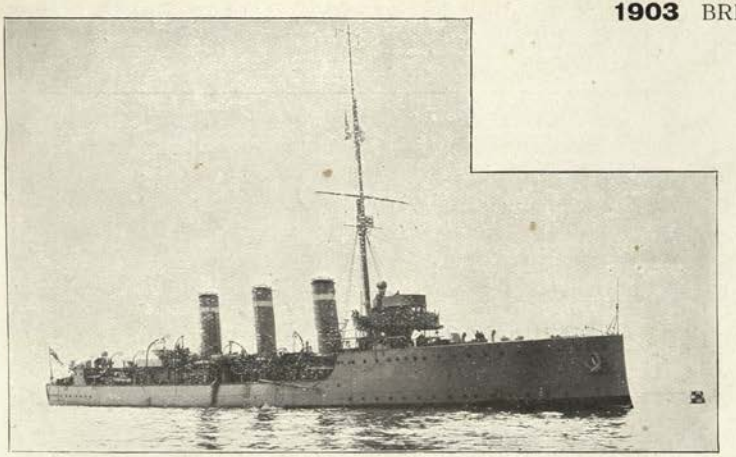
Machinery: 2 sets 6 cylinder. 2 screws. Boilers: White-Forster (with ⅓ cylindrical). Designed H.P. 16,500=25 kts. Coal: *normal* 150 tons; *maximum* 380 tons.

General Notes.—Built and engined by Fairfield. Laid down October, 1903. Completed early in 1905. Average cost, £289,000

First Trials.—Forward, I.H.P. 15,000=25·28. *Foresight*, I.H.P. 15,800=25·28 kts.

Distinctions.—Poop, high funnels, no cowls.

1903 BRITISH LIGHT CRUISERS (25 knot).



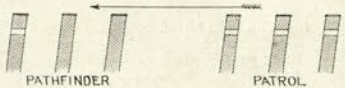
Photo, Hopkins.

PATHFINDER (16th July, 1904), & **PATROL** (13th October, 1904).

Displacement, 2940 tons. Length, 370 feet. Beam, 38¾ feet. *Maximum* draught, 14 feet. Complement, 268

Guns (now in 1913):
9—4 inch
Torpedo tubes (14 inch):
2 *above water*.

Armour:
½″ Deck .....



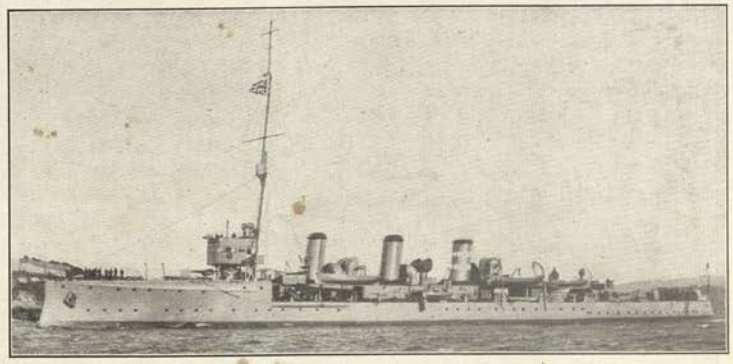
[*As others.*]

Machinery: 2 sets 4 cylinder. 2 screws. Boilers: ⅘ Normand-Laird, ⅕ cylindrical. Designed H.P. 16,500=25 kts. Coal: *normal* 165 tons; *maximum* 380 tons.

General Notes.—Built and engined by Laird Bros., Birkenhead. Laid down August and October, 1903. Completed, 1905. Average cost, £273,000.

Trials.—*Pathfinder*, I.H.P. 17,176=25·32 kts. *Patrol*, I.H.P. 16,460=25·02 kts.

Distinction.—High funnels.



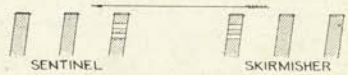
Photo, Abraham & Sons.

SENTINEL (19th April, 1904), & **SKIRMISHER** (7th February, 1905).

Displacement, 2895 tons. Length, 360 feet. Beam, 40 feet. *Maximum* draught, 14¼ feet. Complement, 268.

Guns (re-armed 1913):
9—4 inch
Torpedo tubes (14 inch):
2 *above water*.

Armour:
1½″—⅝″ Deck.



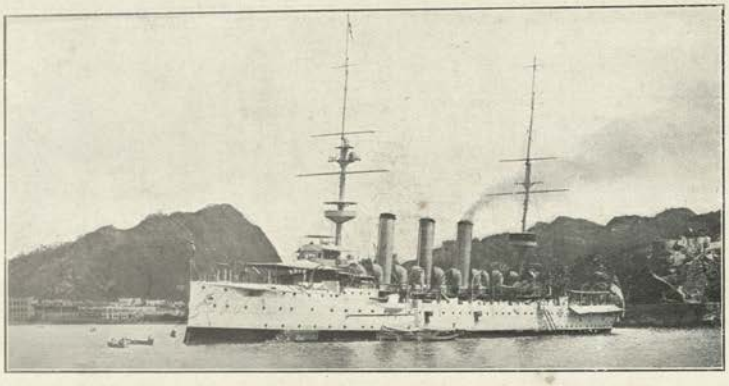
[*As others.*]

Machinery: 2 sets 4 cylinder. 2 screws. Boilers: Express. Designed H.P. 17,500=25 kts. Coal: *normal* 160 tons; *maximum* 380 tons.

General Notes.—Built and engined by Vickers Maxim. Laid down June, 1903, and July, 1903. Average cost, £282,000.

Trials.—*Sentinel*, I.H.P. 17,500=25·25 kts. (rough sea). *Skirmisher*, I.H.P. 16,899=25·2 kts.

Distinctions.—Shorter funnels than the others. Oval funnels. Conspicuous cowls.



HIGHFLYER. (Circular tops, except *C.*) *Photo, by favour of N. D. E. O'Toole, Esq.*

CHALLENGER (May, 1902).

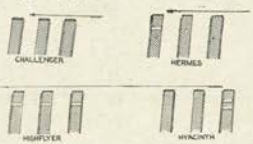
5915 tons. Comp., 475. Length (*p.p.*), 355 feet. Beam, 56 feet. *Max.* draught, 21¼ feet.

also

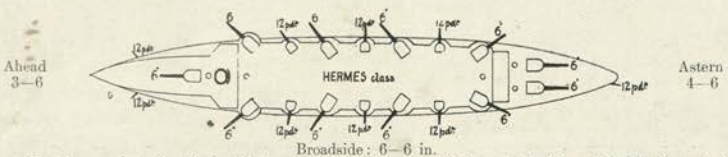
HERMES (April 1898), HIGHFLYER (June, 1898), HYACINTH (October, 1898).

5600 tons. Comp., 450. Length (*p.p.*), 350 feet. Beam, 54 feet. *Max.* draught, 22 feet.

Guns:
11—6 inch wire
8—12 pdr. 12 cwt.
1—12 pdr. 8 cwt.
6—3 pdr.
2 Maxims.
Torpedo tubes (18 inch):
2 *submerged.*



Armour:
3″ Armour deck ..... = *d*
Protection to vitals ... = *d*
5″ Engine hatches ..... = *a*
6″ Conning tower ..... = *b*
(Total weight: *about* 500 tons.)

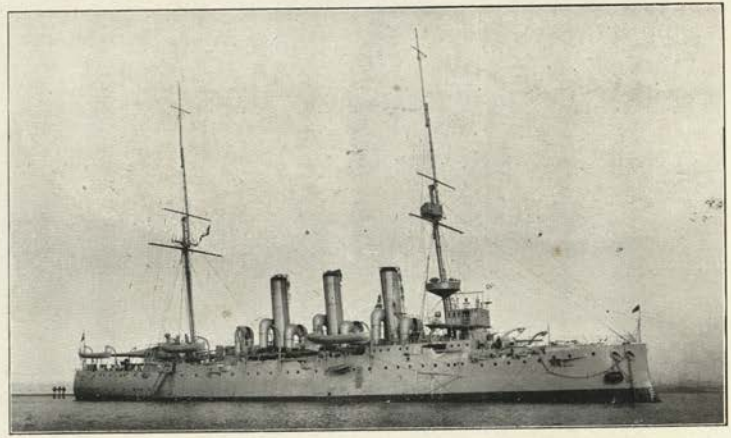


Broadside: 6—6 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: Belleville or Babcock (see notes). Designed H.P. 10,000=20 kts. Coal: *normal* 500 tons; *max.* 1100 tons. Machinery weighs 835 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials: 30 hours at ¼*	*Trials: 8 hours full*	*Boilers*	*Best recent speed*
Challenger	Chatham	Wallsend Co.	Dec. '00	1905	–	12,781=21·1	Babcock	19·8
Hermes	Fairfield	Fairfield & Harland & W.	Apl. '97	1900	7713=18·8	10,500=20·5	Babcock	20·2
Highflyer	Fairfield	Fairfield	June '97	1900	7644=19·4	10,334=20·1	Belleville	
Hyacinth	L. Glasgow	L. Glasgow	Jan. '97	1901	7718=17·34	10,556=19·4	Belleville	19·7

General Notes.—First built under Estimates 1900-01; other three, Estimates 1896-97. *Encounter* of this class now Australian.



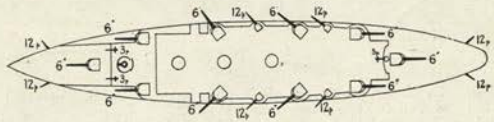
VINDICTIVE (December, 1897).

Displacement, 5750 tons. Complement, 480.

Length, 320 feet. Beam, 57½ feet. *Maximum* draught, 24 feet.

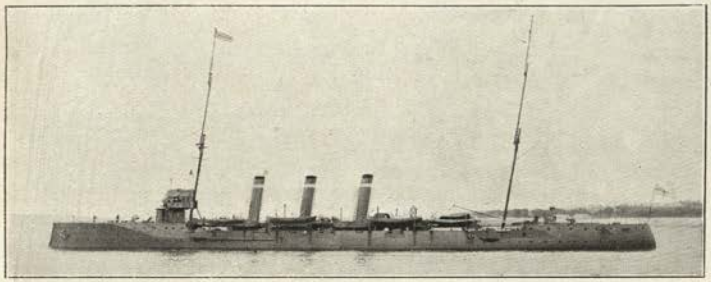
Guns:
10—6 in. VII., 45 cal.
8—12 pdr., 12 cwt.
1—12 pdr., 8 cwt.
3—3 pdr.
2 Maxims.
Torpedo tubes (18 inch):
2 *submerged.*
1 *above water* (stern).

Armour:
2″ Belt (bow) ..... *f*
3″ Armour deck ..... = *d*
Protection to vitals ..... *d*
4″ Engine hatches ..... = *b*
3″ Gun shields .....
8¾″ Conning tower..... *a*



Broadside: 6—6 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: 18 Belleville *without* economisers. Designed H.P. 10,000=19 kts. Coal: *normal* 500 tons; *maximum* 1175 tons.



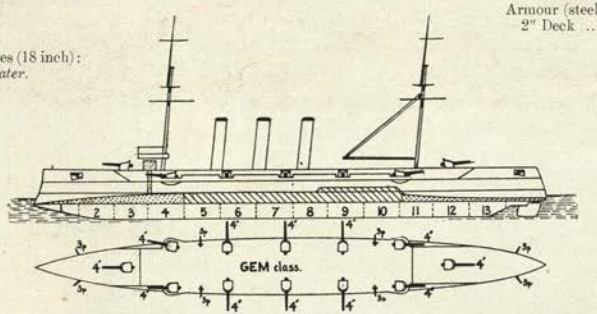
Photo, Symonds & Co.

TOPAZE (July, 1903), **AMETHYST** (Nov., 1903), **DIAMOND** (Jan., 1904), and **SAPPHIRE** (March, 1904).

Displacement, 3000 tons. Complement, 296. Length, 360 feet. Beam, 40 feet. *Mean* draught, 14¼ feet.

Guns:
12—4 inch
8—3 pdr.
Torpedo tubes (18 inch):
2 *above water.*

Armour (steel):
2″ Deck ..... = £



Ahead:
3—4 in.

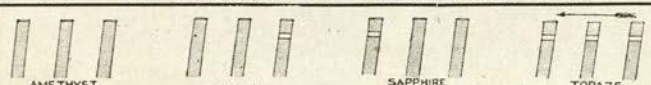
Astern:
3—4 in.

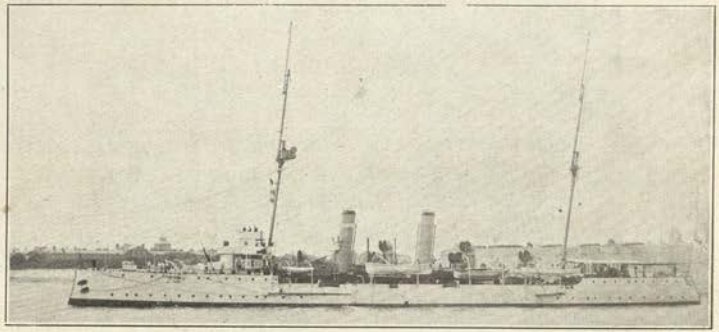
Machinery: 2 sets triple expansion except *Amethyst*, Turbine. 2 screws. Boilers: various (*see notes*). Designed H.P. 9800 = 21·75 kts. *nominal* (23 or more expected). Coal: *normal* 300; *maximum* 500 tons.

Engineering Notes.—Turbine revolutions, 400 at 7000 H.P., 450 at 10,000. Reciprocating engines, 245 at 10,000. *Amethyst* has Parsons turbines with small turbines for cruising speeds (slow).

General Notes.—First two built under estimates, 1902-03, second two, estimates, 1903-4. Cost about £240,000.

Name	*Built by*	*Engines by*	*Laid down*	*Completed*	*8 hours 4/5 power.*	*4 hours full power.*	*Boilers.*	*Best recent speed.*
Topaze	Laird	Laird	Aug., '02	1904	... = ...	... = 22·25	Normand Laird	...
Sapphire	Palmer	Palmer	March, '03	1905	7281 = 20·6	10,200 = 22·3	Normand Laird	...
Amethyst	Elswick	Parsons	Jan., '03	1904	7280 = 20·6	13,000 = 23·6	Yarrow (curved)	20
Diamond	Laird	Laird	March, '03	1905	7145 = 19·3	9,868 = 22·1	Yarrow	...





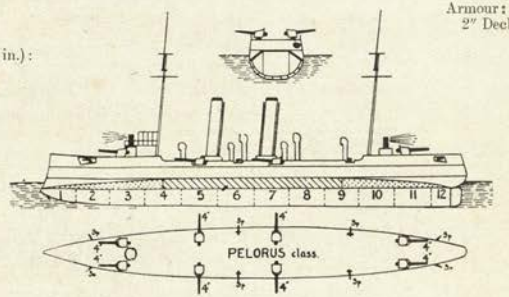
Photo, Symonds & Co.

PELORUS (Feb., 1896), **PEGASUS** (March, 1897), **PYRAMUS** (May, 1897), **PERSEUS** (July, 1897), **PSYCHE** (July, 1898) **PIONEER** (June, 1899), **PROSERPINE** (1896).

Displacement, 2,135 tons, *except* last 2, which are 2,200 tons. Complement, 224.
Length, 300 feet. Beam, 36½ feet. Draught (*max.*), 17 feet; *Pandora*, *Pioneer*, and *Psyche*, 19¼ feet.

Guns:
8—4 inch.
8—3 pdr.
Torpedo tubes (14 in.):
2 *above water.*

Armour:
2″ Deck ..... = £



Ahead:
2—4 in.

Astern:
2—4 in.

Machinery: inverted 3 cylinder triple expansion. 2 screws. Boilers: various, see *Trials*. Designed H.P. 7000 = 20·5 kts. Coal: *normal* 250 tons; *maximum* 500 tons.

Name.	*Built at*	*Engined by*	*Laid down*	*Completed*	*8 hours at 5000*	*4 hours full p.*	*Boilers*	*Speed last sea trial*
Pelorus	Sheerness	Clydebank	May, '95	1897	5075 = 19·7	7028 = 20·7	Normand	...
Pegasus	Palmer	Palmer	May, '96	1899	5400 = 20·0	7134 = 21·2	Reed	...
Perseus	Earle	Earle	May, '96	1901	5239 = 19·1	7058 = 20·0	Thornycroft	17·2
Proserpine	Sheerness	Keyham	Mar., '96	1899	5534 = 19·7	7146 = 21	Thornycroft	...
Pyramus	Palmer	Palmer	May, '96	1900	5424 = 19·9	7303 = 20·7	Reed	...
Pioneer	Chatham	Fairfield	Dec., '97	1900	5265 = 17·7	7192 = 20	Thornycroft	...
Psyche	Devonport	Keyham	Nov., '97	1900	5000 = 19·5	7006 = 20·48	Thornycroft	17

These ships have all lost in speed. Few, can do much over 16 kts.

1894 BRITISH LIGHT CRUISERS (19 knot).

(Eclipse Class—9 Ships.)

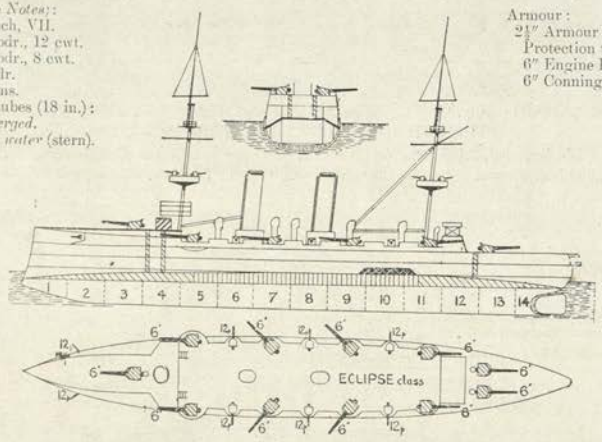
ECLIPSE (July, 1894), **TALBOT** (April, 1895), **MINERVA** (Sept., 1895), **VENUS** (Sept., 1895), **JUNO** (Nov., 1895), **DIANA** (Dec., 1895), **DIDO** (March, 1896), **DORIS** (March, 1896), & **ISIS** (June, 1896).

Displacement, 5600 tons. Complement, 450.

Length (*waterline*), 364 feet. Beam, 54 feet. *Maximum* draught, 23 feet. Length *over all*, 370¾ feet.

Guns (see *Notes*):
11—6 inch, VII.
8—12 pdr., 12 cwt.
1—12 pdr., 8 cwt.
7—3 pdr.
2 Maxims.
Torpedo tubes (18 in.):
2 *submerged*.
1 *above water* (stern).

Armour:
2½″ Armour deck ... = *d*
Protection to vitals = *d*
6″ Engine hatches ...
6″ Conning tower
(Harvey) *c*



Ahead:
5—6 in.

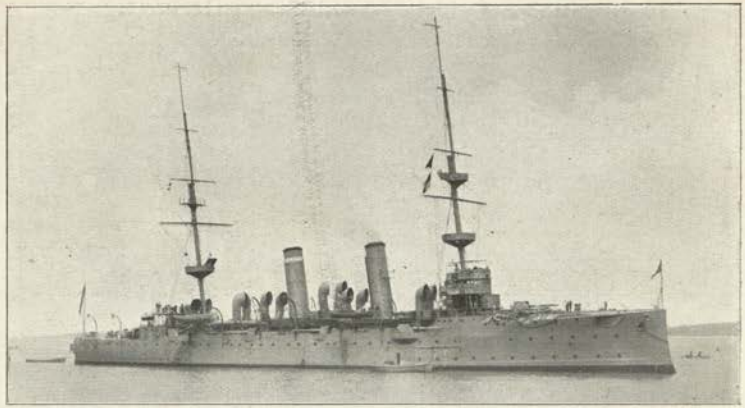
Astern:
4—6 in.

Broadside: 6—6 in.

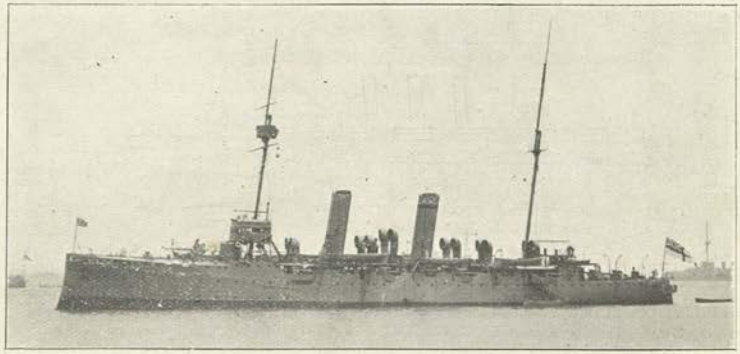
Machinery: 2 sets inverted triple expansion. 2 screws. Boilers: 8 single-ended cylindrical. Designed H.P. *natural* 8000 = 18·5 kts.; *forced* 9600 = 19·5 kts. Coal: *normal* 550 tons; *maximum* 1076 tons.

Gunnery Notes.—*Eclipse* still carries original armament of 5—6 inch, 6—4·7 inch. Others re-armed as given, 1902-05.

Engineering Notes.—24 furnaces. Heating surface, 19,200 square feet. Grate area, 599 square feet. Machinery, &c., weighs 938 tons. All these ships for short periods reach or exceed 19 kts. On trial *light* all touched 20 kts. The *Minerva* made 20 kts. in 1911.

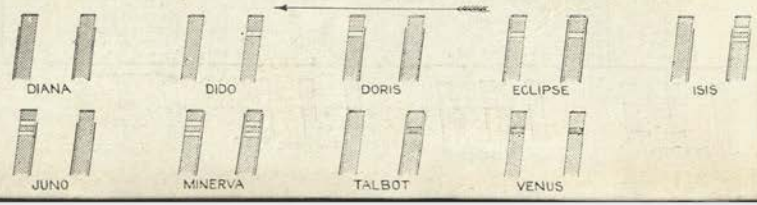


Dido and all others except *Talbot*.

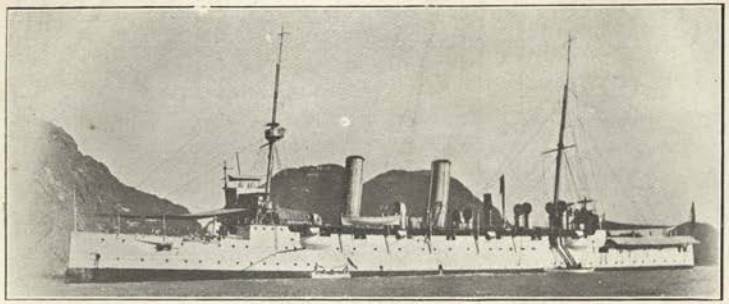


Talbot.

Differences:

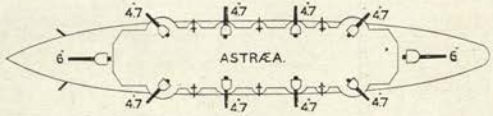


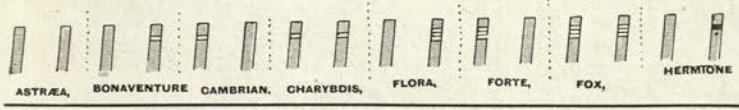
Isis has windsails instead of cowls.



Photo, N. O'Toole, Esq.

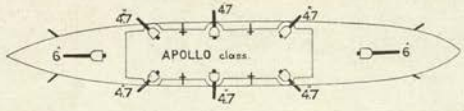
ASTRÆA, CHARYBDIS, FORTE, FOX, HERMIONE (—1893). 4360 tons. Comp., 318. Dimensions (*p.p.*): 320×49½× (*max.*) 21 feet. Armament: 2—6 inch, 8—4·7 inch, 8—6 pdr., 1—3 pdr. 3—18 inch *above water* tubes. Armour: 2″ Deck, 5″ Engine hatches, 3″ Conning tower. Designed H.P. (*f.d.*) 9500=19·5 kts. Coal: *max.* 1000 tons. *Bonaventure*, of this class, now a submarine depôt ship without armament. *Cambrian* and *Flora* struck off list, 1914.

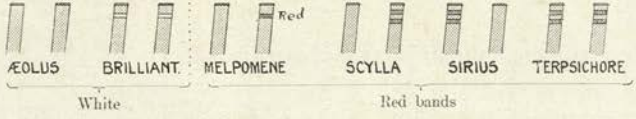


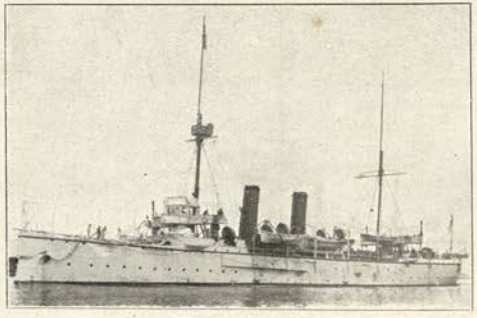


Photo, Hopkins.

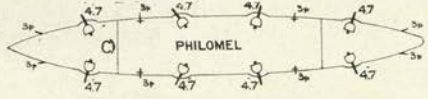
SAPPHO (1891), **SIRIUS** (1890), **MELPOMENE** (*ex Indefatigable*) (1891). 3440 tons. Comp., 273. Dimensions (*p.p.*): 300 × 43½ × 18 feet. Guns: 2—6 inch (wire), 6—4·7 inch, 8—6 pdr., 1—3 pdr. 4—14 inch tubes, *above water*. Armour: 2″ deck. Designed H.P. 7000=18·5 kts. (*nat.*); 9000=20 kts. (*f.d.*) Coal: *max.* 535 tons.







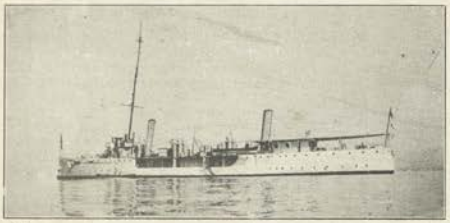
PHILOMEL (Jan., 1890). 2575 tons. Comp., 219. Dimensions (*p.p.*): 265×41×18½ (*max.*) feet. Armament: 8—4·7 inch, 8—3 pdr. Armour: 2½″ Deck. Designed H.P. 4000=16·5 kts. (*n.d.*) Coal: 440 tons.



BRITISH TORPEDO GUNBOATS.

Note.—Most of these are adapted as Mine Sweepers The others are mostly on Fishery protection duties.

HALCYON *class.* Class feature, a poop.



HUSSAR *only.*

DRYAD, HALCYON, HARRIER, HAZARD, & HUSSAR.

(All launched 1893-94.)

Displacement, 1070 tons. Complement, 120.

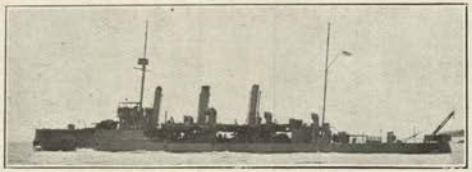
Length, 250 feet. Beam, 30½ feet. *Maximum* draught, 13 feet.

Guns: 2—4·7 inch, 4—6 pdr. Tubes: 5—18 inch. *Hussar* has one 4 inch forward only.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: *Harrier*, locomotive; *Halcyon*, Express; *Hussar*, Thornycroft.

Designed H.P. 3500 = 18·5 kts. Only *Halcyon* can get anywhere near this now.

Coal: *normal* 100 tons; *maximum* 160 tons.



SPEEDY *only.* *Photo, Symonds.*

CIRCE (1892), **HEBE** (1892), **JASON** (1892), **LEDA** (1892), **NIGER** (1892), **SPEEDY** (1893), & **ANTELOPE** (1893).

Displacement, 810 tons. Complement, 85.

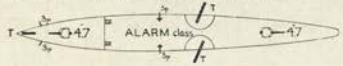
Length, 230 feet. Beam, 27 feet. *Maximum* draught, 12½ feet.

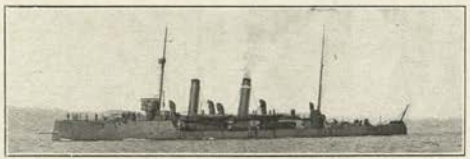
Guns: 2—4·7 inch, 4—3 pdr. Tubes: *Speedy*, *Jason* and *Niger*, 3—18 inch; others, 5—14 inch.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: 4 locomotive, except *Speedy*, Thornycroft; *Niger*, Reed.

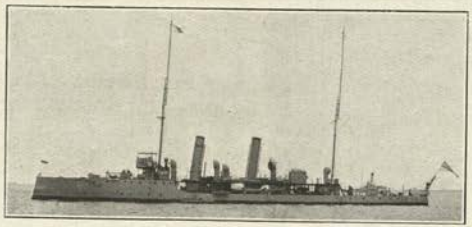
Designed H.P. 3500 = 19 kts., but few of them can get near it now.

Coal: *normal* 100 tons; *maximum* 160 tons.

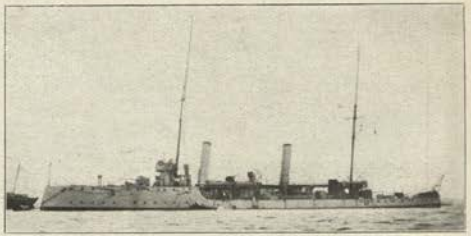




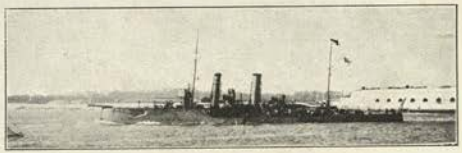
CIRCE.



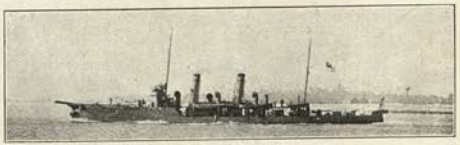
JASON.



The majority are like this, *except*



SEAGULL *only.*



SPEEDWELL *only.*

GOSSAMER (1890), **SEAGULL** (1889), **SHELDRAKE** (1889), **SKIPJACK** (1889), **SPANKER** (1889), & **SPEEDWELL** (1889).

Displacement, 735 tons. Complement, 90.

Length, 230 feet. Beam, 27 feet. *Maximum* draught, 12 feet.

Guns: 2—4·7 inch, 4—3 pdr. Tubes: 5—14 inch.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: *Gossamer*, Reed (1902); *Seagull*, Niclausse (1898); *Skipjack*, Reed (1900); *Spanker*, Du Temple (1897); *Speedwell*, Reed (1903); *Sheldrake*, Babcock.

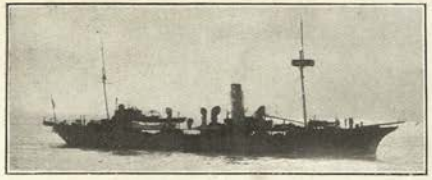
Designed H.P. 3500 = 19 kts. Coal: *normal* 100 tons; *maximum* 160 tons.

10 Sloops.

Photo, G. M. Carter, Esq.

CADMUS, CLIO, ESPIEGLE, ODIN (1900-03). 1070 tons. 6—4 inch, 13¼ kts. Boilers: first two, Niclausse; other two, Babcock.

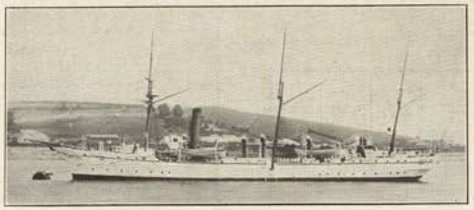
SHEARWATER.



Photo, Symonds.

VESTAL, RINALDO, and *without top*, ROSARIO.

ROSARIO, SHEARWATER, VESTAL & RINALDO (1890-1898). 980 tons. 4—4 inch, 13¼ kts. Belleville boilers.

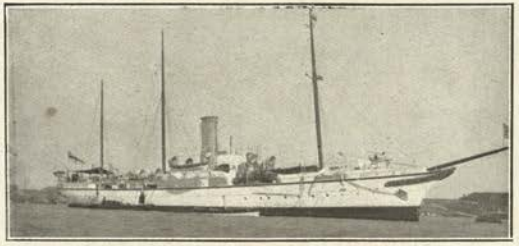


ALGERINE (1895). 1050 tons. Guns: 4—4 inch. Speed: 13 kts. Boilers: cylindrical.

1 funnel, 3 pole masts.

RACER (1884). 970 tons. 2—5 inch aft. *Max.* speed: 10 kts. *(At Osborne Naval College.)*

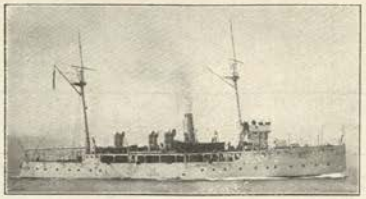
Despatch Vessel.



Photo, P. A. Surgeon Henry, U.S.N.

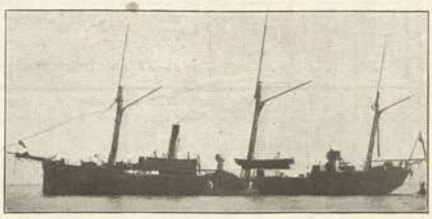
ALACRITY *(ex Surprise)* (1885). 1650 tons. Original speed: 17·8 kts. Armament: 2—6 pdr.

5 Gunboats.



Photo, Maclure Macdonald.

BRAMBLE, BRITOMART, DWARF, THISTLE (1898-99). 710 tons. 2—4 inch, 4—12 pdr., 13½ kts. Now fitted with wireless flying topmasts.



RINGDOVE (1889). 805 tons. 6—4 inch, 2—3 pdr., 13 kts.

Summary of 225 + 15 Destroyers.

No.	Class	Date	Displacement *about*	Ac. H.P.	Designed speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			feet
2	*Special*	'13-'15	...	...	...	...	...	...	...
13	M	'13-'14	742	22,000	35	...	...	4	...
20	L	'12-'13	807	24,500	31	130, *max.* 200	...	4	...
20	K	'12-'13	920	24,500	32	*max.* 160	...	4	...
23	I	'11-'12	760	13,500	27		...	2	...
20	H	'10-'11	800	13,500	27		...	2	...
16	G	'08-'11	900	12,000	27	*max.* 185	...	2	...
5	F	'08-'10	990	15,500	33	*max.* 185	...	2	...
2	F	'07-'09	900	15,500	33	*max.* 185	...	2	...
1	*Swift* F	'06-'08	1800	30,000	36	*normal* 180	...	...	13
5	F	'06-'08	880	14,500	33	*max.* 185	68	4	...
34	E	'02-'06	550	7500	25½	95, *max.* 130	70	2	...
9	D	'00-'04	335	5700	30	*about* 80	60	2	...
36	C	'97-'00	..	..	30	*about* 80	50	2	...
22	30 knotters B	'95-'00	300	6000	30	*about* 80	80	2	11
12	A	'93-'96	290	4000	27	*about* 60	60	2	9

Turbine machinery in all after '06-'08.

Note.—2 E class have been lost, replaced 1910. There are also 2 replace boats in class B (1910).

For 1914-15 twelve boats *N* class are *pro*.

In the following pages boats are arranged in classes according to the official classification of October, 1913.

Special Flotilla Leaders.

1 *Hawthorn*:—**Marksman.**

1 *White*:—**Lightfoot.**

13 M Class.

3 *Clydebank*:—**Milne, Moorsom, Morris.**

2 *Hawthorn*:—**Mansfield, Mentor.**

2 *Palmer*:—**Murray, Myngs.**

1 *Swan H*:—**Matchless.**

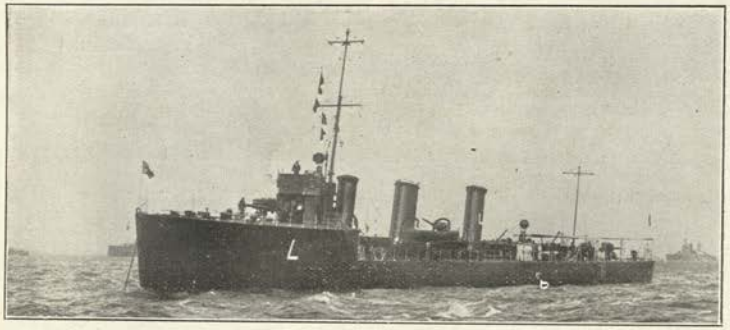
2 *Thornycroft*:—**Mastiff, Meteor.**

3 *Yarrow*:—**Manly, Minos, Miranda.**

20 L Class. (1912-13 Estimates.)

All to Admiralty design. 807 tons. Armament: 3—4 inch, 4—21 inch tubes (in pair). Designed H.P., *nom.*, 24,500=35 kts. Dimensions: 260 × 27¼ × 8¾ feet.

2 *Beardmore*:—**Llewellyn, Lennox.**
2 *Denny*:—**Loyal, Legion.**

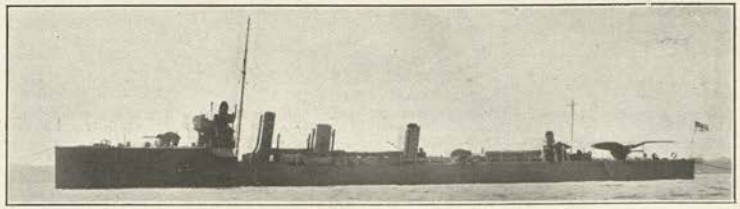


4 *Fairfield*:—**Laforey, Lawford, Louis, Lydiard.** *Photo, Symonds.*
2 *Parsons (Hawthorn)*:—**Leonidas, Lucifer.**
2 *Swan, Hunter & W. Richardson*:—**Laertes, Lysander.**
2 *Thornycroft*:—**Lance, Lookout.**

2 *White*:—**Laurel, Liberty.** *Photo, Symonds.*
4 *Yarrow*:—**Lark, Landrail, Laverock, Linnet.**

20 K Class.

All the boats of this class except the first are to uniform Admiralty design. 950 tons. Armament 3—4 inch, 4—21 inch. tubes (in pairs). Designed H.P. 23,000-25,000=31-32 kts. Dimensions: 266×27×9 feet. *Max.* fuel, 200 tons (oil).



1 *Thornycroft*:—**Hardy** (1912).

2 *Clydebank*:—**Acasta, Achates, Ambuscade** (—1912).
1 *Denny*:—**Ardent.**
1 *Fairfield*:—**Fortune** (1912).
3 *Hawthorn*:—**Christopher, Cockatrice, Contest** (1912).
1 *Parsons*:—(Hull subcontracted to Cammell, Laird). **Garland** (1912).
4 *Thornycroft*:—**Paragon, Porpoise, Unity, Victor** (—1912)
3 *Loudon and Glasgow*:—**Lynx, Midge, Owl** (—1912).
3 *Swan, Hunter*:—**Shark, Sparrowhawk, Spitfire** (—1912).

23 I Class.

This class (programme 1910-11) consists of three special boats, *Lurcher* type; and twenty other boats, of which the first six are to builders' design, and the others all to Admiralty pattern. Class distinction: 2 short funnels. Appearance of all is practically identical.
Armament of all: 2—4 inch, 2—12 pdr., 2—21 inch tubes. Complement, 72.

Special Boats.

Yarrow: **Lurcher, Firedrake, Oak** (——1911). 790 tons. Dimensions: 255 ft. × 25 ft. 7 in. × *mean* 9 feet. Designed H.P. 20,000=32 kts. On trials *Firedrake* made 33·1, *Lurcher* 35·34 *mean* of 8 hrs. Oil fuel: *normal*, 86 tons; *max.*, 160 tons. Turbines: Parsons. 2 screws. Boilers: special Yarrow oil burning.

To Builders' Designs.

2 *Parsons*: **Badger, Beaver** (1911). 780 tons. Designed H.P. 16,500=30 kts. Hull, etc., contracted for by Hawthorn. Trials: *Badger* 30·7. Geared turbines.

2 *Thornycroft*: **Acheron, Ariel** (1911). 773 tons. Designed H.P. 15,000=29 kts. On trial both: 29·4.

2 *Yarrow*: **Archer, Attack** (1911). 780 tons. Designed H.P. 16,000=28kts. These boats are fitted with a special superheated steam device, and on trial easily exceeded contract speed. Trials, *Archer* 30·3, *Attack* 30·6.

Admiralty Design Boats.

Displacement, *nominal*, 750 tons. Dimensions, 240 ft. × 25 ft. 7 in. × 8 ft. 2 in. Designed H.P. 13,500 =27 kts. Oil: 130 tons, *max.*

1 *Beardmore*: **Goshawk.** 780 tons.

5 *Clydebank*: **Hind, Hornet, Hydra.** 775 tons. Trials: *Hind* 28·1, *Hornet* 28·7, *Hydra* 28·1.

2 *Denny*: **Defender, Druid.** 762 tons. Trials: *Defender* 28·3, *Druid* 28·2.

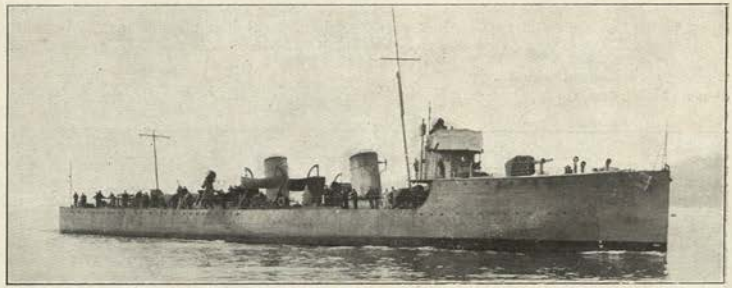
2 *Hawthorn*: **Jackal, Tigress** (1911). 780 tons. Trials: *Jackall* 26·9, *Tigress* 28·1.

2 *Laird*: **Lapwing, Lizard** (1911). 780 tons. Trials: *Lapwing* 27·2, *Lizard* 27·5.

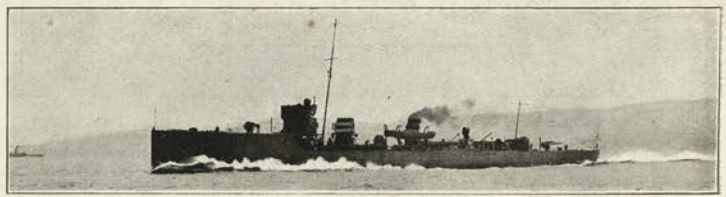
1 *Swan.Hunter*: **Sandfly** (1911) 780 tons. Trials: 27·7.

1 *Vickers*: **Phœnix** (1911). 750 tons. Trials: 27·8.

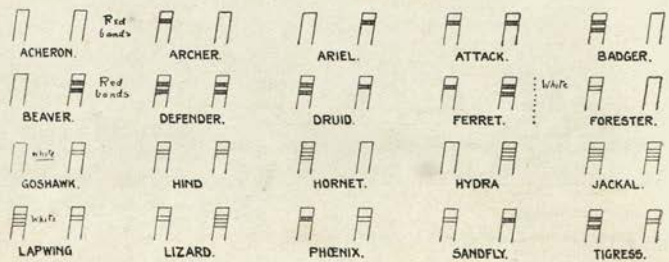
2 *White*: **Ferret, Forester** (1911). 750 tons. Trials: *Ferret* 30·2, *Forester* 29·8.



LURCHER, ETC.



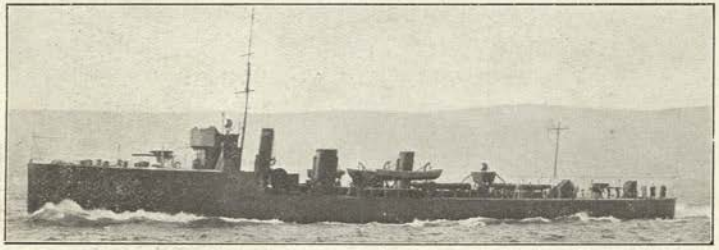
REST OF I CLASS.



20 H Class.

Belong to 1909-10 programme, laid down end of 1909. These boats are all about 800 tons. Armament: 2—4 inch (25 pdr.), 2 –12 pdr., 2—21 inch tubes. Formerly *Acorn* class. Designed H.P. 13,500 = 27 kts. Fuel: 130 tons, oil. Complement, 72.

All are practically identical in appearance. The special feature is three unequal funnels, the foremost raised with a steam pipe half way up.



3 Clydebank:—**Acorn, Alarm, Brisk** (1910). Curtiss turbines. Yarrow boilers Trial results: *Acorn*, 27·2; *Alarm*, 27·2; *Brisk*, 27·6.

2 Denny:—**Sheldrake, Staunch** (1910). Parsons turbines. Yarrow boilers. Trials: *Sheldrake*, 28.3; *Staunch*, 28·6.

3 Fairfield:—**Cameleon, Comet, Goldfinch** (1910). Parsons turbines. Yarrow boilers. Trials: *Cameleon*, 28·03; *Comet*, 27·9; *Goldfinch*, 28.

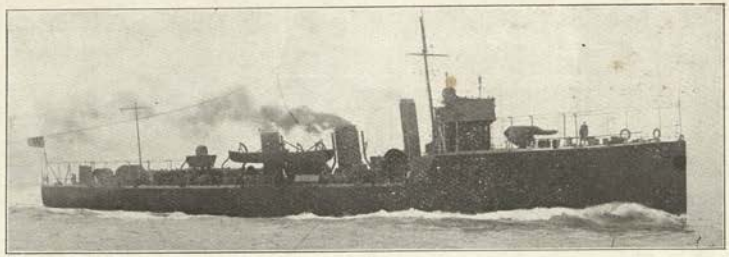
3 Hawthorn:—**Nemesis, Nereide, Nymphe** (1910). Parsons turbines. Yarrow boilers. Trials: *Nemesis*, 27; *Nereide*, 27·8; *Nymphe*, 27·5.

1 Inglis:—**Fury** (1910). Parsons turbines. Yarrow boilers. Trials: 27·3.

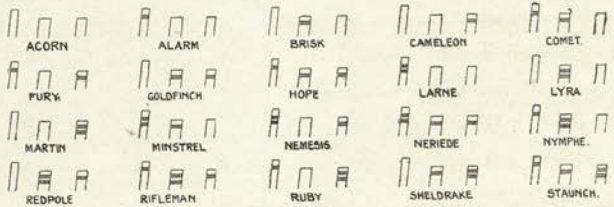
1 Swan Hunter:—**Hope** (1910). Parsons turbine. Yarrow boilers. Trials: 27·1.

4 Thornycroft:—**Larne, Lyra, Martin, Minstrel** (1910). Parsons turbine. Yarrow boilers. Trials: *Larne*, 27·9 *Lyra*, 28·7; *Martin*, 28·9; *Minstrel*, 28·9.

3 White:—**Redpole, Rifleman, Ruby** (1910). Parsons turbine. White-Foster boilers Trials: *Redpole*, 29·8; *Rifleman*, 28·6; *Ruby*, 29.3.



White Boats. These 3 have more prominent steam pipes to amidship funnel than the others.

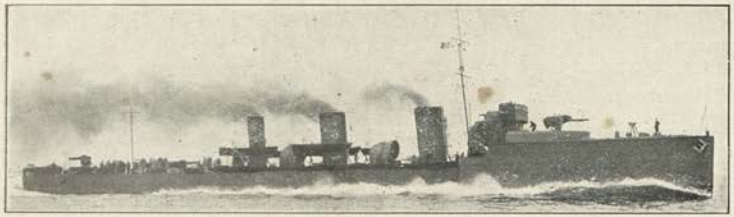


L

16 G Class.

These boats belong to the 1908-09 programme, and were formerly known as the *Basilisk* class. Though varying slightly in displacements (see list below) they are identical in appearance.

Special class feature: three high funnels, space between 1 and 2, and No. 3 thinner than the others.



3 Clydebank:—**Beagle, Bulldog, Foxhound** (1910). 860 tons. Parsons turbine. Yarrow boilers.

1 Denny:—**Pincher** (1910) 940 tons. Parsons turbine. Yarrow boilers.

3 Fairfield:—**Grasshopper, Mosquito, Scorpion** (1910). 860 tons. Parsons turbine. Yarrow boilers.

1 Hawthorn:—**Scourge** (1910). 925 tons. Parsons turbine. Yarrow boilers.

3 Cammell-Laird:—**Racoon, Renard, Wolverine** (1910). 920 tons. Parsons turbine. Yarrow boilers.

1 London & Glasgow:—**Rattlesnake** (1910). 900 tons. Parsons turbine. Yarrow boilers

1 Thames Ironworks:—**Grampus** (ex *Nautilus*), (1910). 915 tons. Parsons turbine. Yarrow boilers. Trials: 26·7.

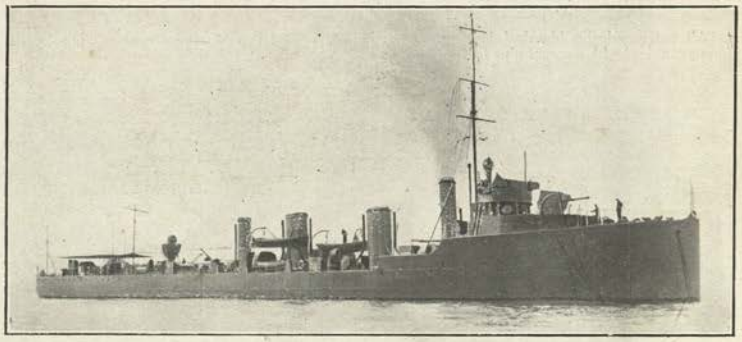
1 Thornycroft:—**Savage** (1910). 885 tons. Parsons turbine. Yarrow boilers.

2 White:—**Basilisk, Harpy** (1910). 935 tons. Parsons turbine. White-Foster boilers.

12 F Class.

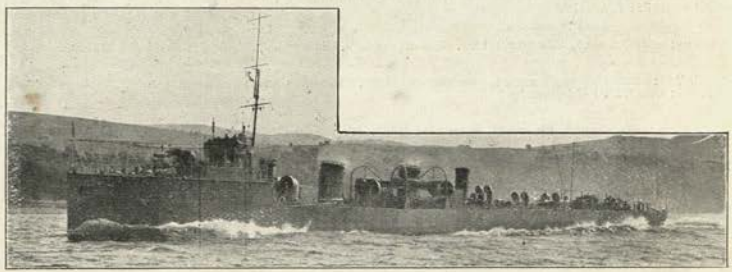
These boats belong (first five) to the 1907-08 programme, the two next to the 1906-07 programme, the remaining five to the 1905-06 programme. They were formerly known as "Ocean-going Destroyers," also as the "Tribal class."

As no two are alike, details are given separately under each boat.



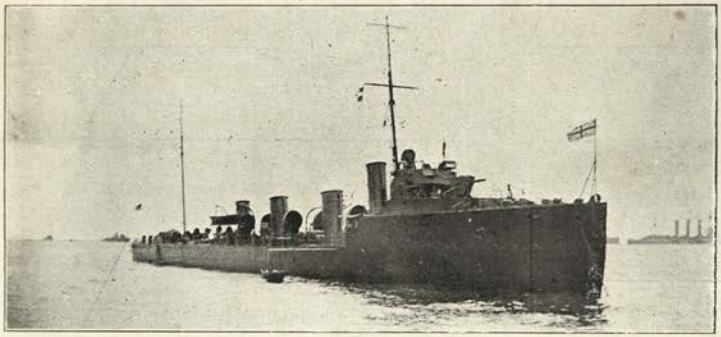
Photo, Cribb.

1 White:—**Crusader.** 945 tons. Armament: 2–4 inch (25 pdr.), 2–18 inch tubes. Parsons turbine. White-Foster boilers. Oil fuel. (Fore funnel heightened 1911.)



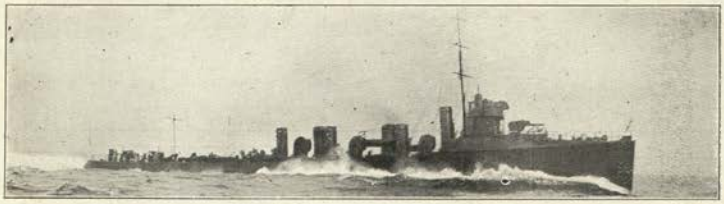
1 Denny:—**Maori** (1909). 980 tons. Armament: 2–4 inch (25 pdr.), 2–18 inch tubes. Parsons turbine. Yarrow boilers. (Fore funnel now heightened, 1912).

F Class—*(Continued).*

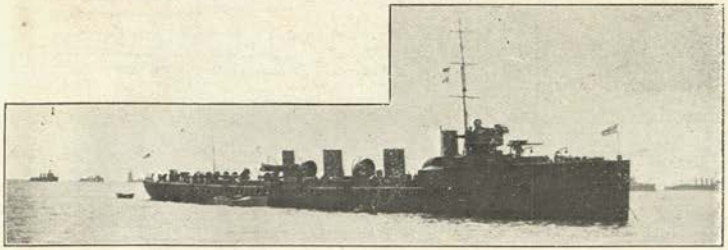


Photo, Oscar Parkes, Esq.

1 Thornycroft:—**Nubian.** 900 tons. Armament: 2–4 inch (25 pdr.), 2–18 inch tubes. Parsons turbine. Thornycroft boilers. Oil fuel.



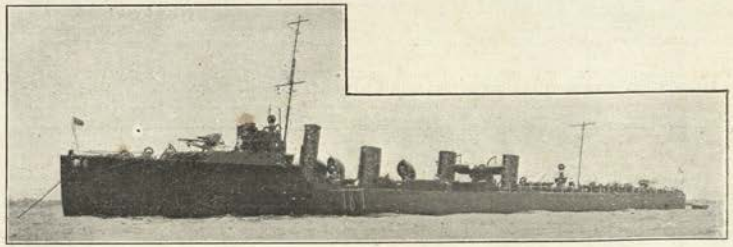
1 Palmer:—**Viking** (1909). 1000 tons. Armament: 2–4 inch (25 pdr.), 2–18 inch tubes. Parsons turbine. Yarrow boilers.



Photo, Oscar Parkes, Esq.

1 Hawthorn:—**Zulu** (1909). 1000 tons. Armament: 2–4 inch (25 pdr.), 2–18 inch tubes. Parsons turbine. Yarrow boilers. (Fore funnel heightened 1911.)

F Class—*(Continued).* (2 of 1906-07 programme).



1 Thornycroft:—**Amazon** (1908). 966 tons. Dimensions: 280×26½×8½ feet. H.P. 15,500. Parsons turbine. Thornycroft boilers. Oil: 86 tons *normal*; *maximum*, 185 tons. Armament, 2–4 inch (25 pdrs.), 2–18 inch tubes.

Photo, Oscar Parkes, Esq.

1 White:—**Saracen.** 970 tons. Dimensions: 272×26×8½ feet. H.P. 15,500. Parsons turbine. White-Foster boilers. Oil: 81 tons *normal*; *maximum* 185 tons. Armament, 2–4 inch (25 pdrs.) 2–18 inch tubes. (Fore funnel heightened 1911.)

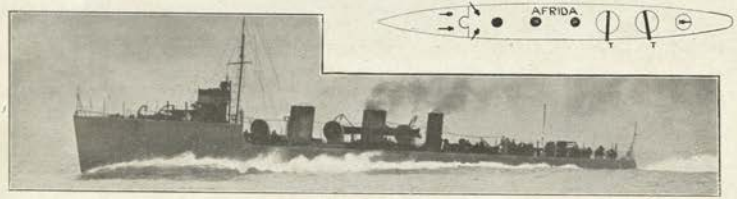
BRITISH DESTROYERS (ordered 1906). **1907**

Parsons turbine, and oil fuel in all. *Maximum* radius, 1500—1700 miles.

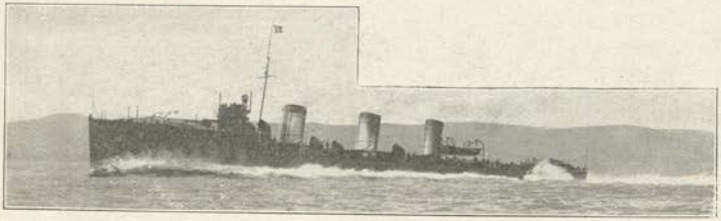
Unclassed boat of equal date.

1 Cammell-Laird:—**Swift** (1907). 1825 tons. Dimensions: 345×34¼×10¼ feet. Oil: 180 tons. H.P. 30,000=36 kts. Yarrow boilers. Armament: 4—4 inch (25 pdr.), 2—18 inch tubes. Cost about £280,500.
(This boat has reached 39 knots).

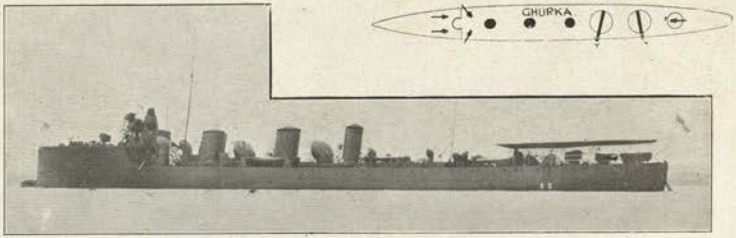
F Class—*(Continued).*



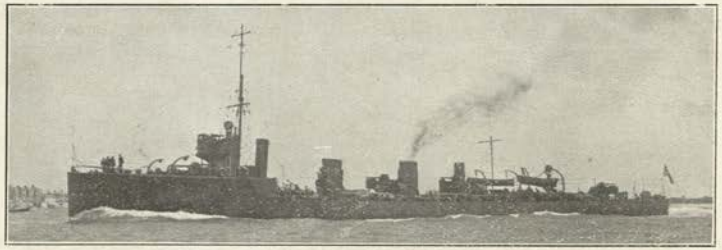
1 Elswick:—**Afridi** (1907). 855 tons. Dimensions: 250×25×7¼ feet. H.P. 14,250=32·75. Oil: 92½ tons. Armament: 5—12 pdr., 2—18 inch tubes. Yarrow boilers.



1 Cammell-Laird:—**Cossack** (1907). 885 tons. Dimensions: 270×26×8 feet. H.P. 14,000. Oil: 76 tons; *maximum* 185 tons. Armament: 5—12 pdr., 2—18 inch tubes. Yarrow boilers. *Cossack* has proved to be a remarkably good sea boat.
(*Now carries a small mast aft*).

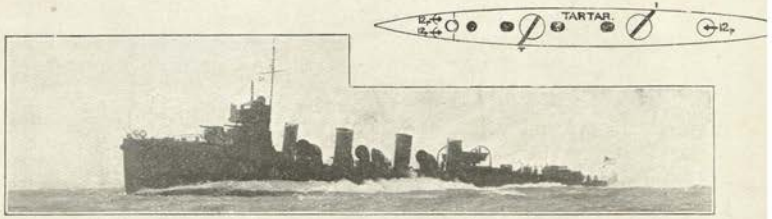


1 Hawthorn:—**Ghurka.** 870 tons. Dimensions: 255×25½×8 feet. H.P. 14,250. Oil: 95 tons; *maximum*, 185 tons. Armament: 5—12 pdr., 2—18 inch tubes. Yarrow boilers.



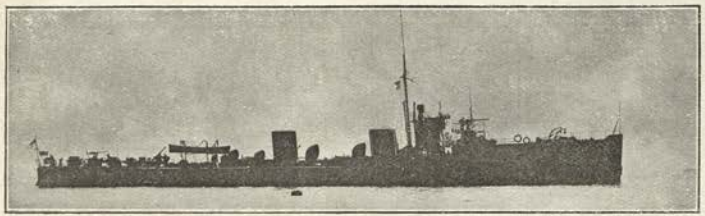
Photo, Symonds.

1 White:—**Mohawk** (1907). 865 tons. Dimensions: 270×25×8 feet. H.P. 14,500. Oil: 95 tons; *maximum*, 185 tons. Armament: 5—12 pdr., 2—18 inch tubes. White-Foster boilers.



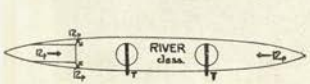
1 Thornycroft:—**Tartar** (1907). 870 tons. Dimensions: 270×26×8 feet. H.P. 14,500. Oil: 74 tons; *maximum*, 185 tons. *Trial: maximum*, 37·4 kts.; *mean*, 35·36. Armament: 5—12 pdr., 2—18 inch tubes. Thornycroft boilers.

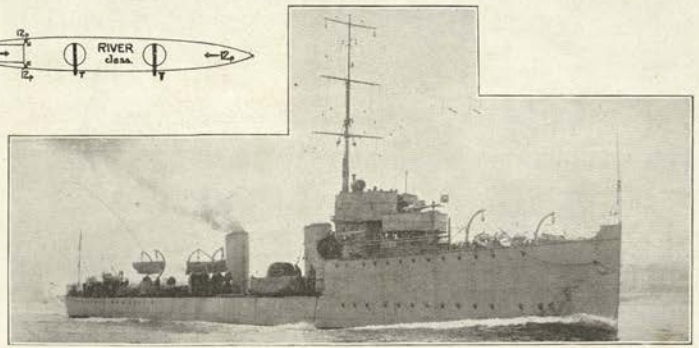
34 BRITISH "E Class" DESTROYERS (1903-05). 1904-06 (ex *River* Class).



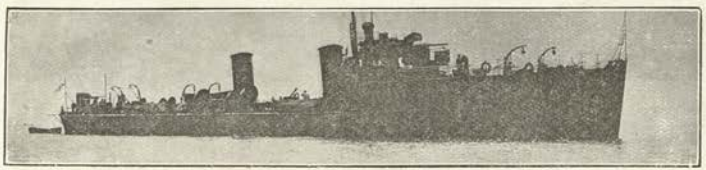
(Two short funnels).

6 *Hawthorn*:—**Boyne, Derwent, Doon, Kale, Waveney, Eden** *(turbine).*



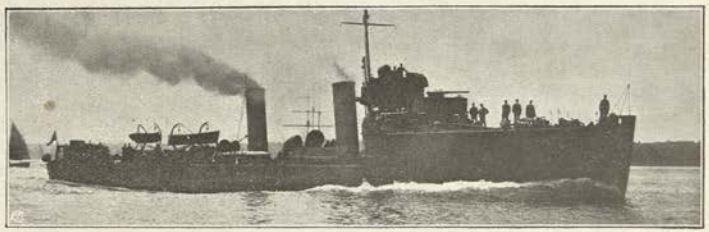


2 *White*:—**Nith, Ness** (1905).



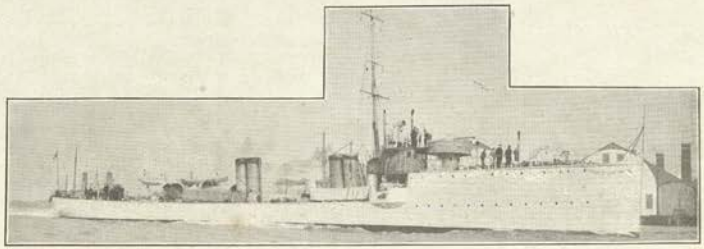
(Two medium funnels).

8 *Cammell-Laird*:—**Arun, Foyle, Itchen, Liffey, Moy, Ouse;** also replace boats **Stour, Test.**



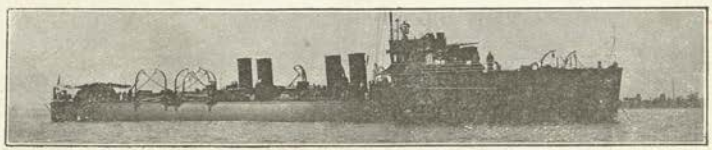
(Two high funnels).

4 *Thornycroft*:—**Chelmer, Colne, Jed, Kennet.**



(Four funnels closely paired).

9 *Palmer*:—**Cherwell, Dee, Erne, Ettrick, Exe, Swale, Ure, Wear** (1904), **Rother** 1905).



(Four funnels openly paired, and no raised piece in the eyes).

5 *Yarrow*:—**Ribble, Teviot, Usk, Welland** (1904), **Garry** (1905).

Note.—Average displacement, 550 tons Average dimensions, 225 × 23½ × 12 feet (*maximum* draught).

Armament: 1—12 pdr., 12 cwt., 3—12 pdr., 8 cwt., 2—18 inch tubes.

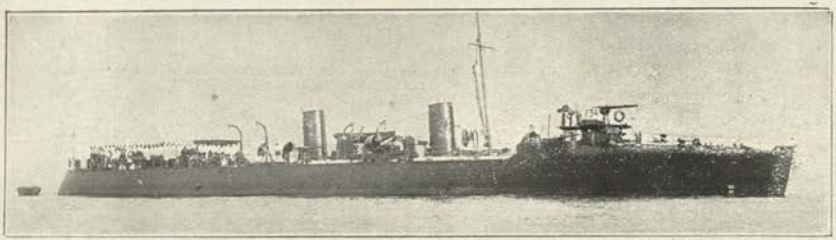
Average H.P. 7000=25½ kts. Machinery: Reciprocating. Boilers: *Hawthorn* boats, Yarrow; *Palmer*, Reed; others, makers' types. Coal: about 130 tons. Complements: 70.

All these are good sea-boats, and are good for a steady 24 kts. Their endurance at full power is about 12—15 hours. At low speeds they are extremely economical, and their actual radius something like 2000 miles.

8 Class D.

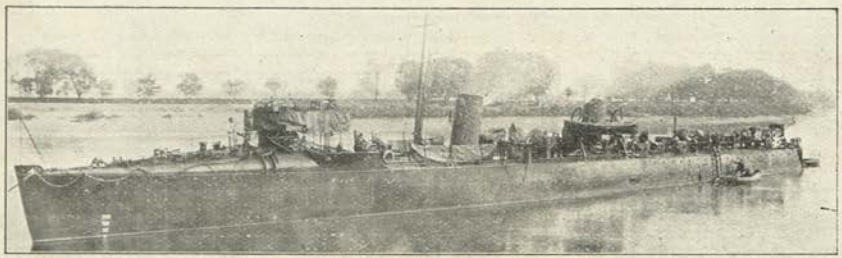
Average 335 tons. Armament of all, 1—12 pdr. (*forward*). 5—6 pdr., 2—18 inch tubes. Designed H.P., *average* 5,700 = 30 kts. Boilers: Thornycroft in all. Coal, 80 tons. Complement, 60.

Special feature: *all boats of D class have only 2 funnels.*



(Cut-away bow, big round stern, both tubes abaft funnels).

3 *Thornycroft*:—**Angler, Desperate, Fame.** Trials: *Angler*, 30·4; *Desperate*, 30·3; *Fame*, 30·1.



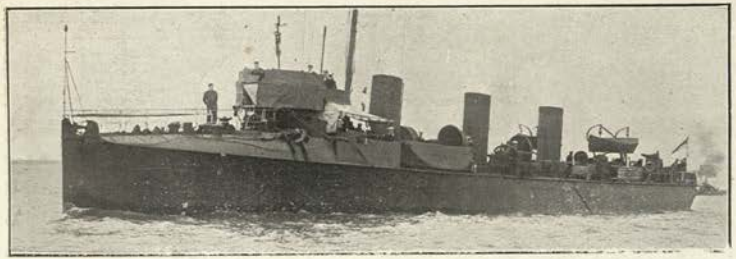
(Cut-away bow, rudder showing (instead of Thornycroft stern), tubes both aft).

5 *Thornycroft*:—**Cygnet, Cynthia, Coquette, Mallard, Stag.** Trials: *Cygnet*, 30·3; *Cynthia*, 30·2; *Coquette*, 30·3; *Mallard*, 30·1; *Stag*, 30·5.

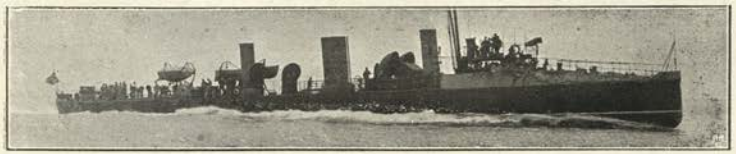
35 Class C.

Average 335 tons. Armament of all, 1—12 pdr. (*forward*), 5—6 pdr., 2—18 inch tubes. Designed H.P., *average* 5,700 = 30 kts. Boilers: Thornycroft in all. Coal: 80 tons. Complement: 60.

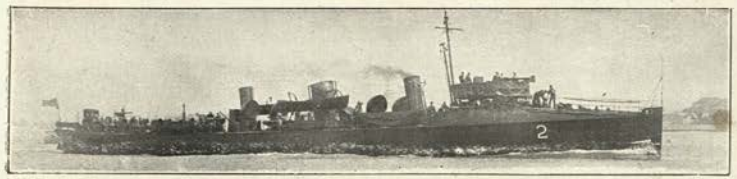
Special feature: *all boats of C class have 3 funnels.* Turtleback bow, big bridge.



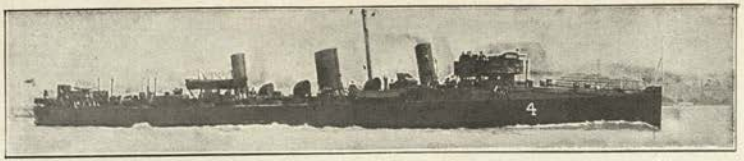
6 *Fairfield:*—**Falcon, Fairy, Gipsy, Leven, Ostrich Osprey** (*tube between 2 and 3 funnels and abaft*).



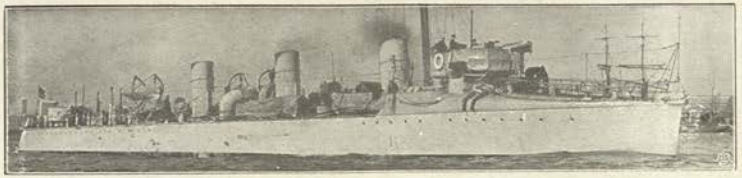
(*High funnels.*)
5 *Hawthorn:*—**Cheerful, Mermaid, Racehorse, Roebuck, Greyhound.** 5 *Vickers:*—**Avon, Bittern, Leopard, Otter, Vixen.** 2 *Earle:*—**Dove, Bullfinch.**



6 *Palmer:*—**Bat, Crane, Star, Fawn, Flying Fish,** *and (with different funnel tops and searchlight on platform abaft bridge)* **Flirt.** 2 *Clydebank:*—**Vigilant, Thorn.** 2 *Doxford:*—**Sylvia, Violet.**

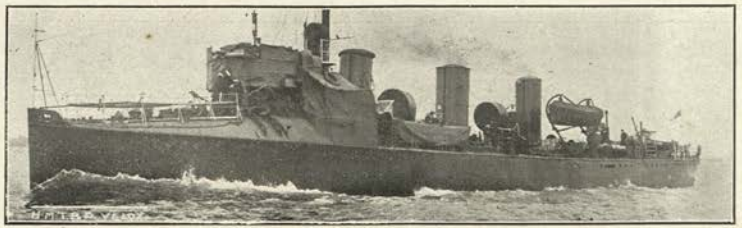


5 *Clydebank:*—**Brazen, Electra, Kestrel, Recruit, Vulture.**



(*Three equal funnels.*)

1 *Thornycroft:*—**Albatross** (*both tubes abaft*).

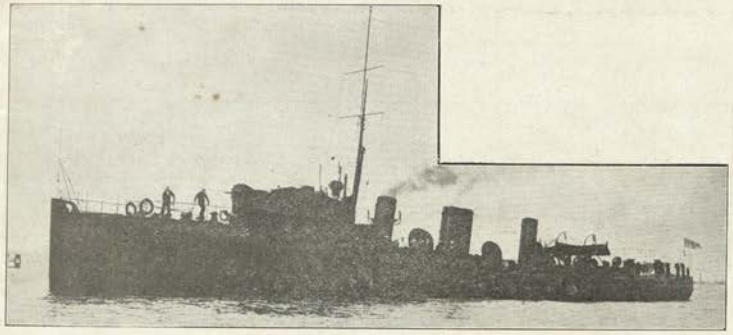


1 *Hawthorn:*—**Velox** (*tubes as Albatross, x1. platform abaft bridge, after funnel much smaller than other two*).

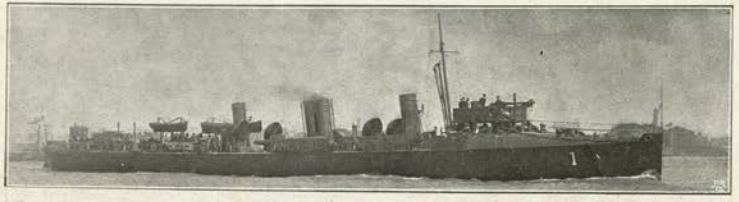
21 Class B.

General details as below. Armament of all except first two is 1—12 pdr. (forward), 5—6 pdrs., 2—18 inch tubes. Were originally classed as 30-knot destroyers.

Special feature of these is the big fore-bridge, and turtleback bow. *All boats of B class have four funnels.*



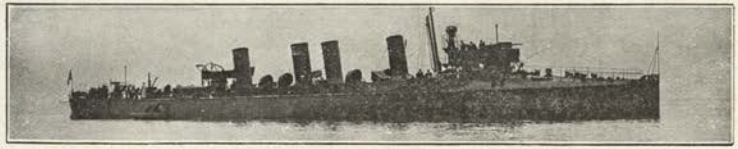
2 *Palmer*:—**Albacore** & **Bonetta** (1909). 440 tons. Armament: 3—12 pdr., 2—18 inch tubes Parsons turbine. Coal fuel. *(Replace boats.)*



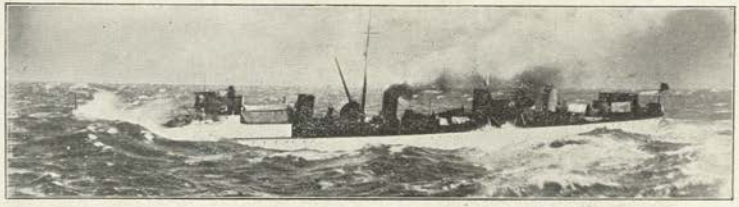
(Middle funnels extremely close together).

5 *Palmer*:—**Kangaroo, Myrmidon, Peterel, Spiteful, Syren.** *(middle funnels still closer together and without the bands which the Palmer boats have).* 85 tons. Complement, 62.

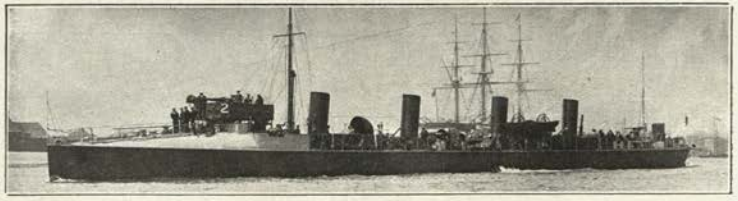
1 *Doxford*:—**Success** (middle These average 380 tons. Coal,



1 *Clydebank*:—**Arab** (1901). 470 tons. Dimensions: 218×20×5 *(mean)*. H.P. 8,600=31 kts. Coal, 90 tons. Comp., 60.

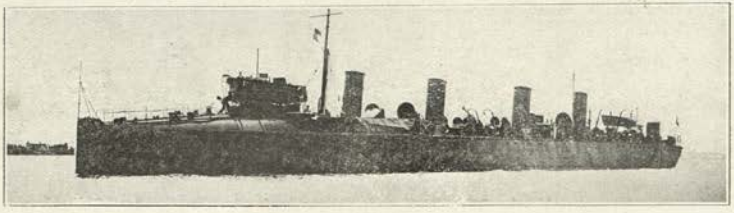


1 *Laird*:—**Wolf** (details as per *Earnest*, etc.)



(Funnels very wide apart).

10 *Laird*:—**Earnest, Griffon, Locust, Quail, Thrasher, Panther, Seal, Orwell, Lively, Sprightly.** Vary from 395—355 tons. H.P. in all, 6,300=30 kts. Coal, 80 tons. Complement, 60.



1 *Laird*:—**Express** *(stern somewhat depressed aft)* (1897). 465 tons. Dimensions: 235×22×9 feet. H.P. 9,250=30·1 kts, *(first trials)*. Coal, 80 tons. Complement, 60.

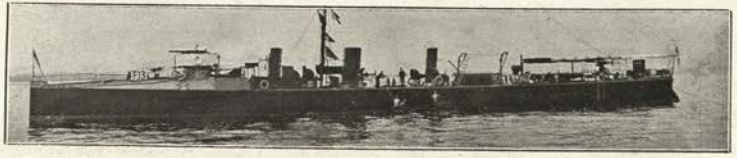
12 Class A

Old boats dating from 1893-95. Average displacement: 290 tons. Average dimensions: 200 × 19 × *about* 9 feet (*max.*) Armament in all: 1—12 pdr. (forward), 5—6 pdr., 2—18 inch tubes. Original H.P. *about* 4000 = 27 kts.

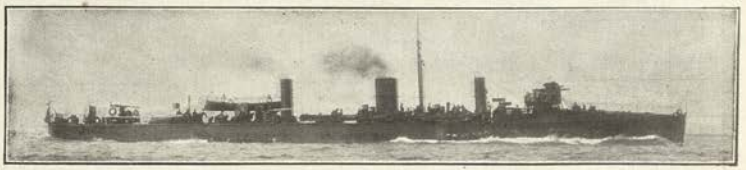
Special feature of these, originally classed as 27 kt. t.b.d., is turtleback bow and *small* fore bridge.

(Ram bow, round Thornycroft stern, small bridge, tubes both aft).

2 *Thornycroft:*— **Boxer, Bruiser.**



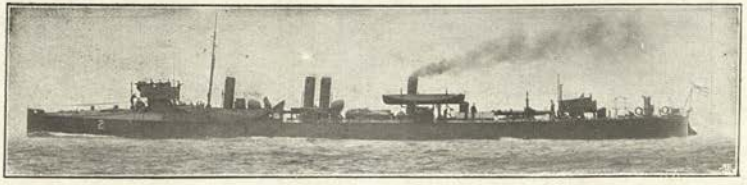
3 *Hawthorn:*— **Ranger, Opossum, Sunfish.**



2 *Palmer:*— **Lightning, Porcupine.** 1 *Clydebank:*— **Surly.**

(Irregular funnels).

2 *White:*— **Conflict, Wizard** *(very low in water, and with cut-away sterns).*

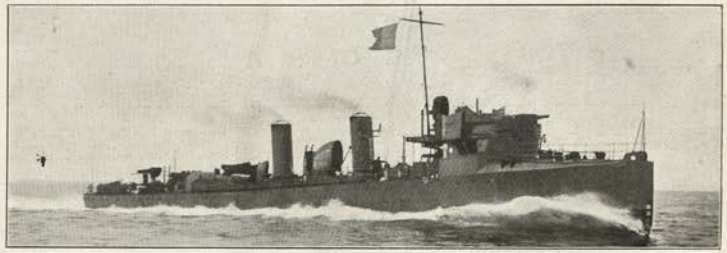


2 *Hanna-Donald:*— **Fervent, Zephyr.**

Summary of 109 Torpedo Boats.

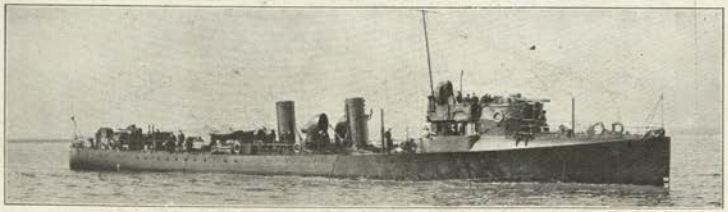
No.	Builders.	Numbers.	Launched.	Displacement.	H.P	*Max.* speed.	Tubes.	Coal or oil.	Complement.
				tons. *average.*		kts.		tons	
12	*Various*	36—25	1908	260	4000	26	3	24	35
12	*Various*	24—13	1907	260	4000	26	3	24	35
12	*Various*	12—1	1906	225	3750	26	3	20	35
4	White	117—114	1903	205	2900	25	3	23	32
5	Thornycroft	113—109	1902	200	2900	25	3	42	32
4	Thornycroft	99, 98; 107 & 108	1901	178	2850	25	3	20	32
1	Laird	97							
3	White	96—94	1893—94	130	2000	23	3	25	18
3	Thornycroft	93—91							
1	Yarrow	90	1895	100	1430	23	3	18	18
1	Yarrow	88	1894	112	1600	22	3	20	18
6	Yarrow	87—82	1889	85	1100	23	3	20	19
1	White	81	1885	125	...	20	3	35	25
1	Yarrow	80	1887	105	1540	23	5	30	21
1	Yarrow	79	1886	75	1000	22½	3	20	16
16	Yarrow	061—078	1886	75	700	20	5	20	16
19	Thornycroft	060—041	1886	60	700	21	4	16	16
2	Yarrow	039, 040	1885	40	500	17	1	...	15
5	White	038—034	1886	65	950	19	5	...	15

Missing numbers, 56, 62, 75, 87, 89, 100—106, have been lost or struck off list. Most of the old boats have been or are being re-boilered with water tube boilers.

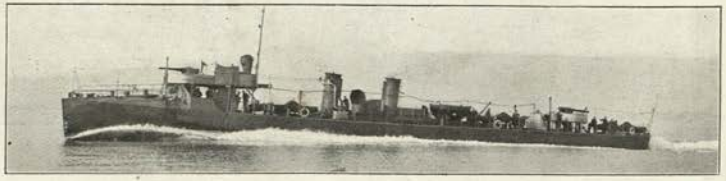


4 *Hawthorn* boats:—**34, 33;** also **22, 21.** 265 tons. Armament: 2–12 pdr., 3–18 inch tubes. H.P. 4000. 3 screws Parsons turbine. Oil fuel: *normal* 23 tons.

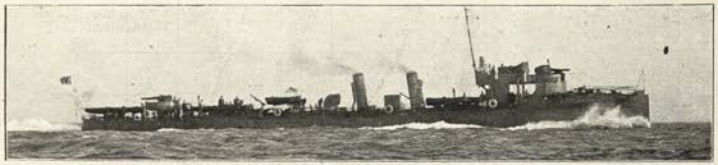
4 *Thornycroft* boats:—**32, 31;** also **20, 19.** 278 tons. Dimensions: 178½×18½×6 feet. Armament: 2–12 pdr., 3–18 inch tubes. H.P. 4000. 3 screws. Parsons turbine. Oil: *normal* 24 tons.



3 *Palmer* boats:—**36, 35** and **24.** 263 tons. Dimensions: 177×18×6 feet *mean*. Armament: 2—12 pdr., 3—18 inch tubes. H.P. 4000. 3 screws. Parsons turbine. Oil: *normal* 24 tons.



4 *Denny* boats:—**30, 29;** also **18, 17.** 259 tons. Dimensions: 180×18×*mean* 5½ feet. Armament: 2—12 pdr., 3—18 inch tubes. H.P. 4000=26 kts. Oil: *normal* 25 tons.

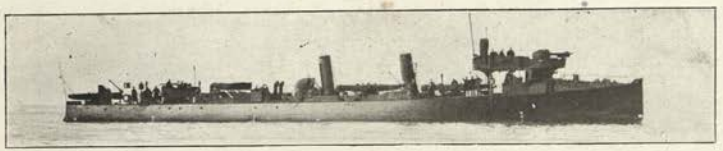


8 *White* boats:—***28, 27, 26, 25*** (1908); also ***16, 15, 14, 13*** (1907). 256 tons. Dimensions: 182×18×*mean* 6 feet. Armament: 2—12 pdr., 3—18 inch tubes. H.P. 4000=26 kts. Parsons turbine. 3 screws. Oil: *normal* 25 tons.

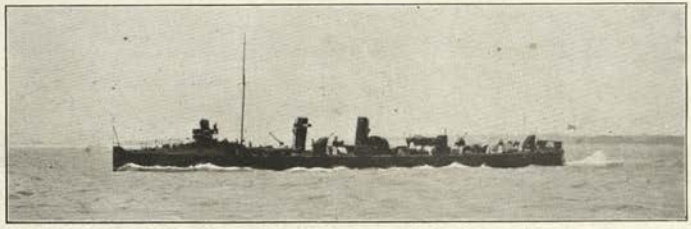
1 *Yarrow* boat:—***23*** (1907). 253 tons. Dimensions: 177×18×*mean* 5½ feet. Armament: 2—12 pdr., 3—18 inch tubes. H.P. 4000=26 kts. Parsons turbine. 3 screws. Oil: *normal* 24 tons.

Yarrow boats:—***12, 11*** (1906). 225 tons. Dimensions: 172×18×*mean* 5½ feet. Armament: 2—12 pdr., 3—18 inch tubes. H.P. 3750=26 kts. Parsons turbine. 3 screws. Oil: *normal* 20 tons.

5 *Thornycroft*:—***10, 9, 8, 7, 6*** (1906). 215 tons. Dimensions: 166½×17½×*mean* 5½ feet. Armament: 2—12 pdr., 3—18 inch tubes. H.P. 3750=26 kts. Parsons turbine. 3 screws. Oil: *normal* 20 tons.



5 *White* boats:—***5, 4, 3, 2, 1*** (1906). Dimensions: 175×17½×*mean* 5½ feet. Armament: 2—12 pdr. 3—18 inch tubes. H.P. 3750=26 kts. Parsons turbine. Oil fuel: *normal* 26 tons.

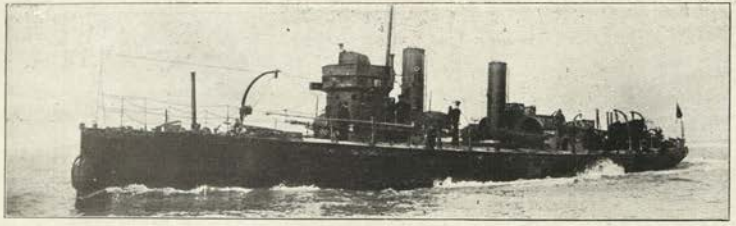


4 *White* boats:—***117, 116, 115, 114*** (1903). Dimensions: 165×17½×8½ feet. Armament: 3–3 pdr., 3—14 inch tubes. H.P 2900=25 kts. 1 screw. Coal: 23 tons.

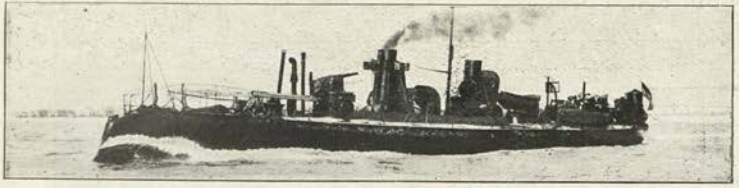
9 *Thornycroft* boats:—***113, 107;*** also ***99, 98*** (1902-01).

97-90; also ***88.***

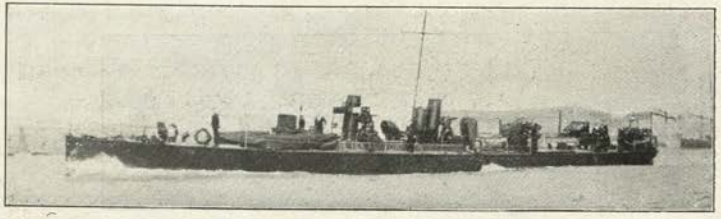
87, 86, 55, 84, 83, 82, 80.



81 (*ex Swift*).



79, 78, 040 and **039.**



060-041. Very similar are **038-034.**

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. Tubes	*Max.* draug't
			tons		kts.	tons			ft.
8	F 8—1	1913	940 / 1200	5000 / ?	20 / 12	...	...	6	...
1	"S" *Fiat* S.G. type	1913	300 / 345	...	13 / 8·5	...	...	2	...
11	E 11—1	1912	725 / 810	1750 / 600	16 / 09	...	...	4	...
7	D 8—D 3	1911	550 / 600	1750 / 550	16 / 10	...	...	3	...
1	D 2	1910							
8	C 38—C 31	1909	280 / 313	600 / 200	14 / 10	15	16	2	12
12	C 30—C 19	1908							
1	D 1	1907	550 / 600	1200 / 550	16 / 9	...	...	3	...
7	C 18—C 12	1907	280 / 313	600 / 200	13 / 8	15	16	2	12
10	C 10—C 1	1906							
10	B 11—B 1	1905	280 / 313	600 / 200	13 / 8	15	16	2	12
8	A 13—A 5	1904	180 / 207	550 / 150	11·5 / 7	7	11	2	11½

C 11, B 4, A 7 and *A 3* have been lost.

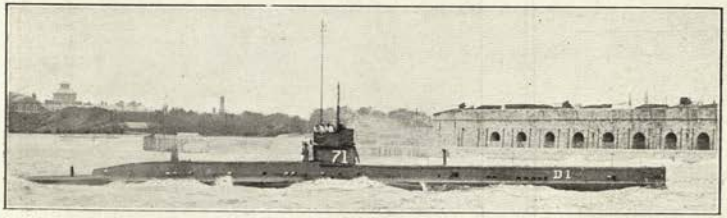
Submarines under construction include:

E class up to No. 18.
F class?
Nautilus and *Swordfish*, ocean going, 2,500 h.p.
4 V class (Vickers special) 1,050 tons. 19 kts. surface.
4 W class (Elswick: Laubeuf type).
4 S class (Scott: F.I.A.T. Laurenti type.

"E" Class. Diesel engines. *Photo, Symonds & Co.*

Photo, Symonds & Co.

D 8—2. Diesel motors. Radius: 4000 miles. Armament: 2—12 pdr., 3 tubes.

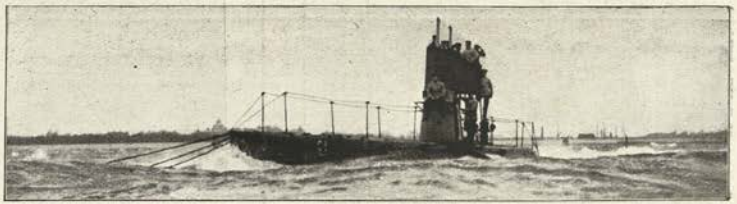


D 1. Diesel motor. Armament: 1—12 pdr., 3 tubes.

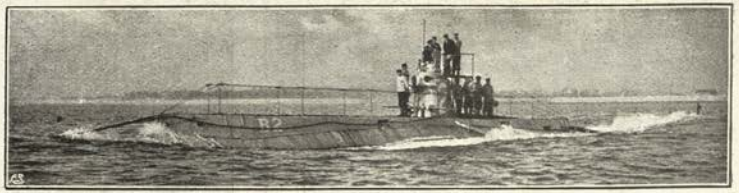
Photo, Symonds & Co.

C 38—C 19. 12 cylinder petrol motors. Radius: $\frac{2000}{150}$

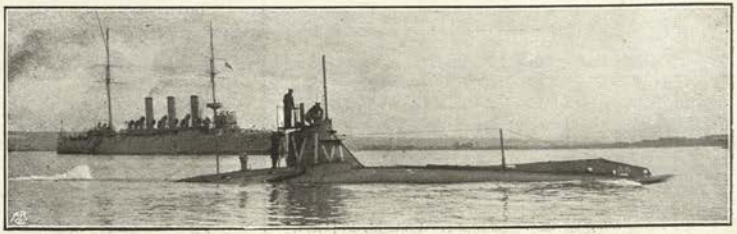
Photo, Symonds & Co.



C 18—C 1. Dimensions: 135×13¾×11¼ feet. 1 screw. Surface radius, 1500 miles. Engine: 16 cyl. horizontal opposed.

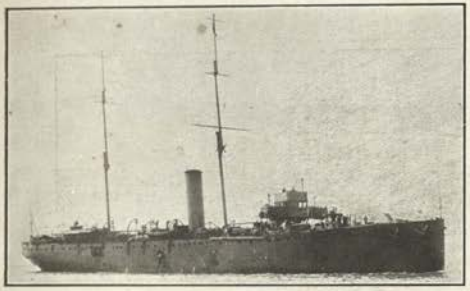


B 11—B 1. Dimensions: 135×13¼×11¼ feet. 1 screw. Surface radius, 1500 miles. Engine: 16 cyl. horizontal opposed.



A 14—A 5. Dimensions: 100×12¼×11¼ feet. 1 screw. Surface radius, 1000 miles. Engine: 16 cyl. horizontal.

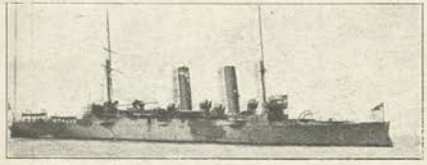
Torpedo Depot Ships.



WOOLWICH. (Scotts S. & E. Co.) tons. Guns: 4—4 inch, 4—12 pdr.

Photo wanted.

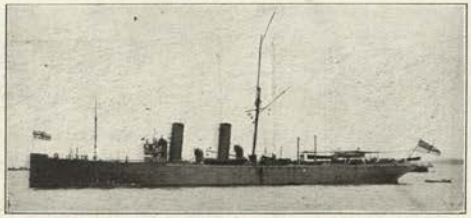
ST. GEORGE (1890). 7700 tons. Complement . Length, 360 feet (*p.p.*). Beam, 30 feet. *Mean* draught, 23¾. Designed H.P. 12,000 = 19·5 kts. Coal: *normal*, 850 tons; *maximum*, 1260 tons.



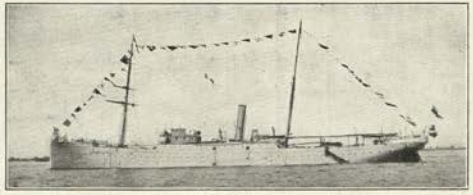
BLAKE (1889) & **BLENHEIM** (1890). 9000 tons. Length, 375 feet (*p.p.*). Beam, 65 feet. *Maximum* draught, 27¼ feet. Armament: 4—old 6 inch, 16—3 pdr., 2—14 inch. *Submerged* tubes: 2—14 inch. *above water*. Designed H.P. 20,000 = 21 kts. Coal: *normal*, 670 tons; also 470 tons carried in small bags (1 cwt. each) for destroyers.

(*Blake* plain funnels; *Blenheim* one band on after funnel.)

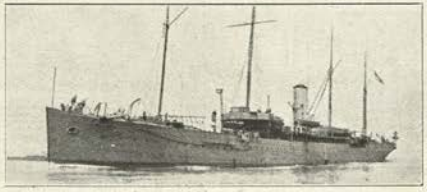
Torpedo Depot Ships—(*Continued*).



LEANDER (1880). 4300 tons. Length, 300 feet (*p.p.*). Beam, 46 feet. *Maximum* draught, 24 feet. Armament: 6—3 pdrs. Armour: 1½" deck amidships. Coal: *normal*, 725 tons; *maximum*, 1000 tons.



TYNE (1878). 3560 tons. Complement 135. Length, 320 feet (*p.p.*). Beam, 34 feet. *Mean* draught, 18½ feet. Armament: 2—24 pdr. Howitzers. Designed H.P. 1200 = 11 kts. Coal: 510 tons.



HECLA (1878). 6400 tons. Length (*p.p.*), 391½ feet. Beam, 39 feet. *Mean* draught, 23 feet. Designed H.P. 2400 = 12 kts.

Submarine Depot Ships.

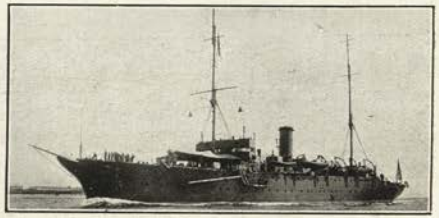
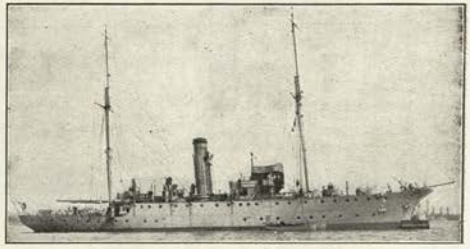
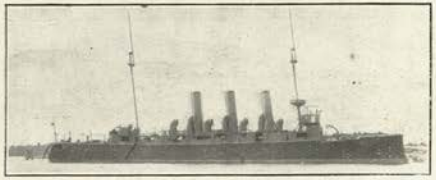


Photo. Cribb.

MAIDSTONE (Scott's S. & E. Co., 1911). 3600 tons. H.P. 2800 = 14 kts. Coal: 460 tons.



ADAMANT (Laird, 1911) & **ALECTO** (Laird, 1911). 935 tons. Dimensions: 190 × 32½ × 11 (*mean*) feet. Designed H.P. 1400 = 14 kts. Coal: 180 tons.

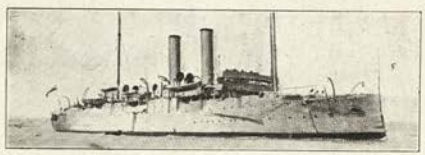


ARROGANT (1896). 5750 tons. Designed H.P. 10,000 = 19 kts. Belleville boilers. Coal: *normal*, 500 tons; *maximum* 1175 tons. (Converted 1911-12.)

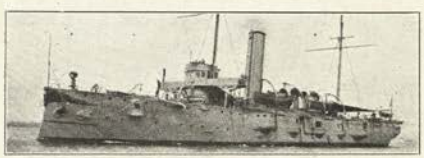
(*Continued on next page.*)

Submarine Depot Ships—(*Continued*).

BONAVENTURE (1892), of the *Astræa* class. 4360 tons. Armament: 2—6 inch, 8—6 pdrs. Deck 2 on slope. Designed H.P. 9000 = 19·5 kts. Cylindrical boilers. Coal: *normal*, 400 tons; *maximum*, 1000 tons.

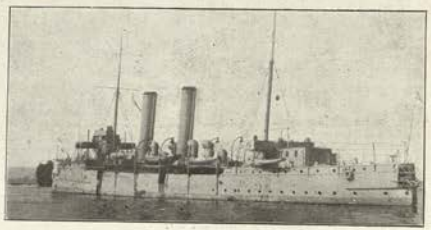


VULCAN (1889). Displacement, 6620 tons. Complement, 433. Length, 350 feet. Beam, 58 feet. *Maximum* draught, 24¾ feet. Guns: 8—4·7 inch, 12—3 pdr., 12 Nordenfelts. Torpedo tubes: 2 *submerged*, 4 *above water*. Armour: 5″ Deck (amidships), 6″ Conning tower, 5″ Engine hatches. Designed H.P. 12,000 = 20 kts. Can do now about 16 kts. Carries 6 small torpedo boats. Coal: *maximum* 1300 tons. Dürr boilers (1909).



THAMES (1885) & **FORTH** (1886). 4050 tons. Length, 300 feet (*p.p.*). Beam, 46 feet. *Maximum* draught, 19½ feet. No guns. Designed H.P. 5700 = 17·2 kts. originally. Coal: 900 tons *maximum*.

7 Mine Layers.

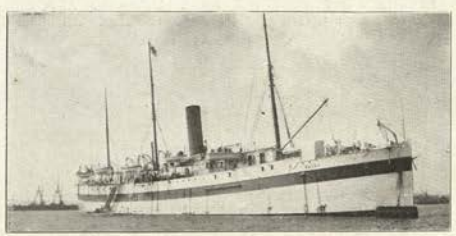


IPHIGENIA, THETIS, APOLLO, ANDROMACHE, INTREPID, LATONA, NAIAD (all about 1891) of the *Apollo* class 3400 to 3600 tons. Armament: 6—6 pdrs.

Hospital Ships.

Building.

MEDIATOR (1912). 400 feet long.



MAINE (1887). 4500 tons. Length, 315 feet. Beam 40 feet. *Depth*, feet.

Mine Sweepers.

(All *ex* trawlers.)

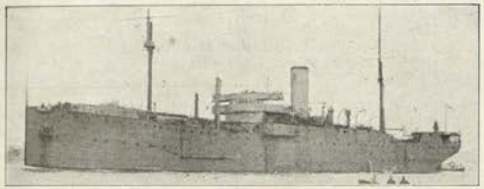
DAISY (1911) & **ESTHER** (1912). 600 tons. (On surveying service at present.)

SEAFLOWER, SEAMEW, SPIDER. 150 tons.

∞**SPARROW.** 150 tons Also **DRIVER.**

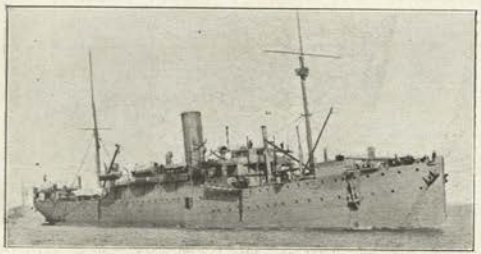
Note.—Six old t.g.b. (which see), also fitted as mine sweepers.

3 Repair Ships.



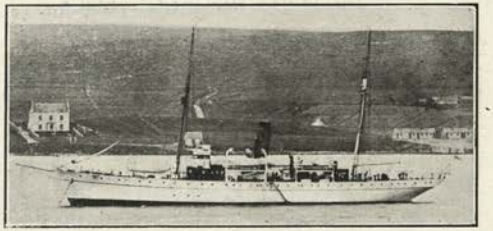
CYCLOPS (*ex Indiabarrah*) (1905). 11,000 tons. Complement 300. Length (*p.p.*), 460 feet. Beam, 55 feet. Armament: 6—4 inch. Machinery: Triple expansion. Designed H.P. =14 kts. Coal capacity: 2000 tons.

AQUARIUS (*ex Hampstead*) (1902). 2800 tons. Length (*p.p.*), 268 feet. Beam, 37¾ feet. Draught, 16 feet. Speed, 10·5 kts.



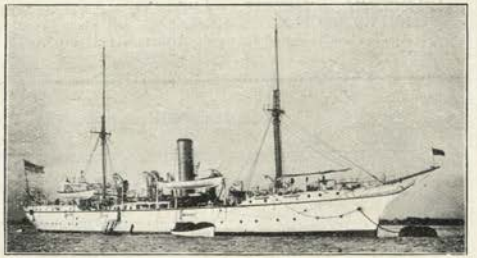
ASSISTANCE (1901). 9600 tons. Complement, 262. Length (*p.p.*), 436 feet. Beam, 53 feet. Draught, 20 feet. Armament: 10—3 pdrs. Machinery: Triple expansion. Boilers: Cylindrical. Fitted with Howden's forced draught. Designed H.P. (*f.d.*) 4200=13 kts. Coal: *normal*, 1800 tons.

Surveying Service.

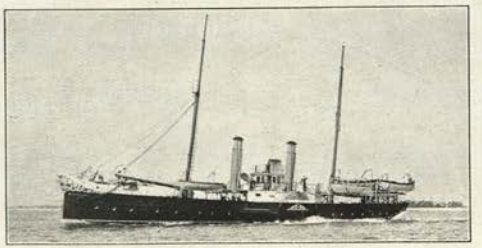


Photo, Abrahams & Sons.

ENDEAVOUR (Fairfield, 1912). 1280 tons. Comp. 136. Length, 200 feet. Guns: 1—3 pdr., 2 Maxims. H.P. 1100=13 kts. Coal: 200 tons. Specially built for survey.

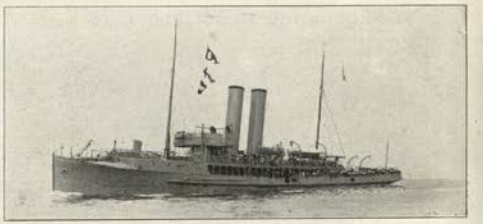


MERLIN & **FANTOME** (1901). 1070 tons. Also, with 3 yards on foremast, **MUTINE** (1900). 980 tons. All about 13¼ kts. Belleville boilers.



RESEARCH (1888). 520 tons. Guns: 1—old 7 pdr. M.L. Speed about 9½ kts.

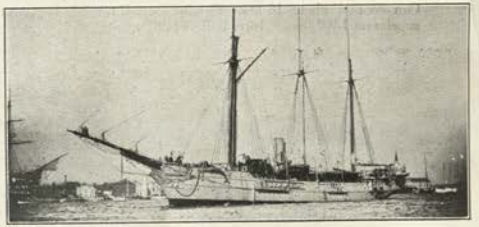
Surveying Service—(*Continued*).



HEARTY (1885). 1300 tons.

Photo, Abrahams & Sons.

TRITON (1882). 410 tons. Guns: 1—old 7 pdr. M.L. Speed, 9 kts.



SEALARK (1878). 900 tons. Speed about 9-10 kts.

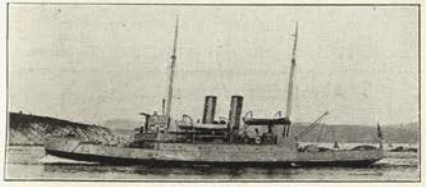
Note.—The *Esther* and *Daisy* (*page* 95) are at present used for surveying work also.

Special Service.

Photo, Abrahams & Sons.

FORTITUDE (*ex Neptune*) (1896). 400 tons. H.P. 1200.

MAGNET (1883). 430 tons. Guns: 4—3 pdr. H.P. 650 = 12 kts.



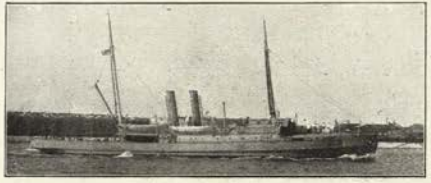
Photo, Abrahams & Sons.

TRAVELLER (1883). 700 tons. Guns: 4—3 pdr. H.P. 1100 = 12 kts.

1 funnel, 2 masts.

IMOGENE (1882). 460 tons. H.P. 390 = 11 kts.

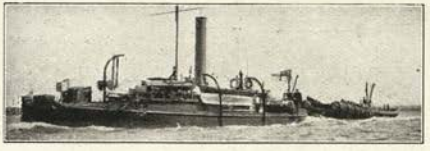
SPHINX (1882). 1130 tons. Guns: 1—old 6 in., 6—old 4 in. H.P. 1100—12·5 kts.



SEAHORSE (1880). 670 tons. Guns: 1—12 pdr. howitzer. H.P. 1100 = 12·5 kts.

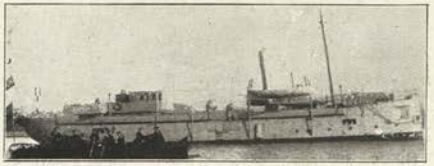
Photo, Abrahams & Sons.

UNDINE (*ex Wildfire, ex Hiawatha*) (1880). 453 tons. Speed 9 kts.



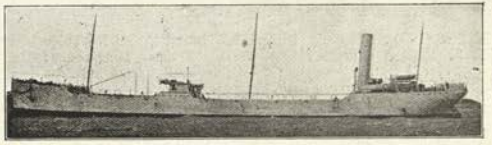
VESUVIUS (1874). 245 tons. 2 torpedo tubes.

Miscellaneous Special Service.



RAVEN (1882). (*ex* gunboat). 465 tons. *Diving School.*

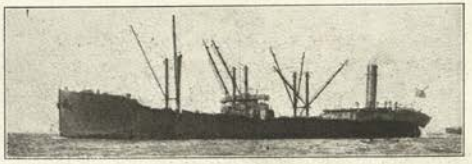
Special Petrol or Oil Ships.



PETROLEUM, KHAKI, ISLA (1903). 4521 tons. Length, 370 feet. Beam, 49 feet. *Depth*, 39 feet. Also **BURMA.** 3945 tons.

Also *TREFOIL & TURMOIL building.*

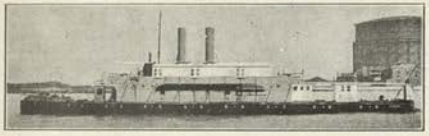
Special Collier.



MERCEDES (1902). 9900 tons. Dimensions: 351 × 50 × 28 feet. H.P. 2350 = kts.

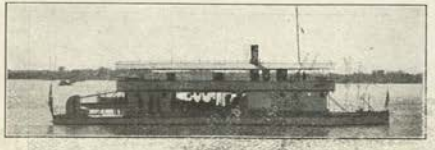
River Gunboats.

KINSHA (1900). 160 tons. 180×30×6 feet. Guns, 6 Maxims. H.P. 600=14 kts. Coal: 60 tons.



WIDGEON (1904). 195 tons. Dimensions: 160×24½×2½ feet; also **TEAL** (1901) & **MOORHEN** (1901). 180 tons. Dimensions: 160×24½×2¼ feet. Armament: 2—6 pdr. Bullet-proof hull, &c. H.P. 800=13 kts. *Yarrow built.*

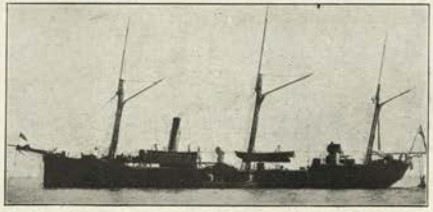
WOODCOCK (1897) & **WOODLARK** (1897). 150 tons. Dimensions: 145×24×2 feet. Armament: 2—6 pdr. Bullet proof hull, etc. H.P. 550=13 kts. *Thornycroft built.*



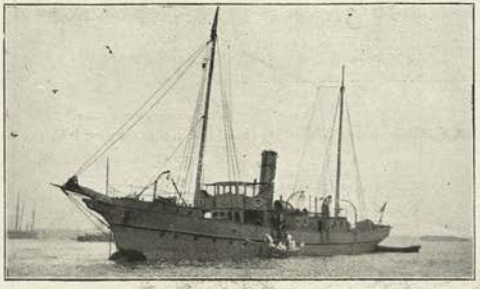
NIGHTINGALE, ROBIN, SANDPIPER, SNIPE (all 1897). 85 tons. 100×20×1¾ feet. Guns: 2—6 pdr. H.P. 240=9 kts. *Yarrow* built.

Coastguard Cruisers.

WATCHFUL (1912) and another pro. 600 tons.

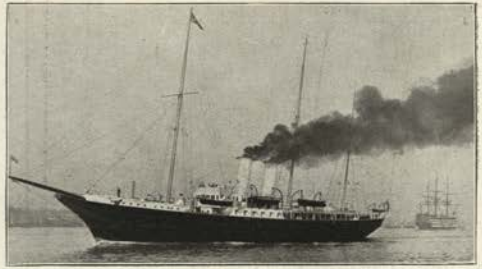


THRUSH, 805 tons (sister to *Magpie*, etc.) (*Ex* gunboat.)

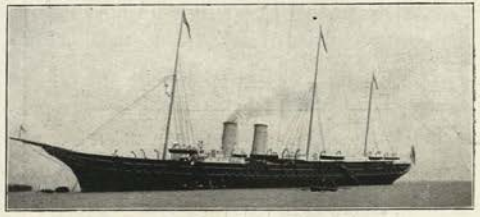


ARGUS & **SQUIRREL** (1905). 350 tons. Also **COLLEEN,** 416 tons. **JULIA,** 278 tons.

2 Royal Yachts.

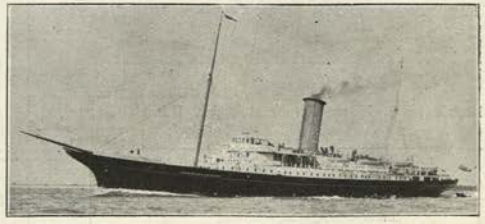


ALEXANDRA (1907). 2050 tons. 18-25 kts. Parsons turbines. Yarrow boilers.



VICTORIA & **ALBERT** (1899). 4700 tons. 20 kts. Belleville boilers.

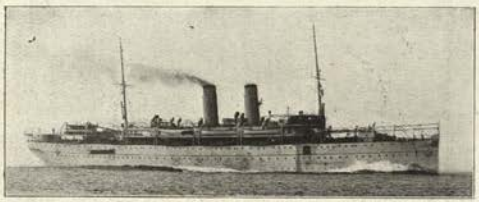
1 Admiralty Yacht.



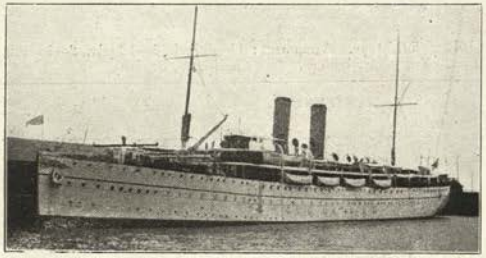
ENCHANTRESS (1903). 3470 tons. Armament: 4—3 pdr. 18 kts. Yarrow boilers.

INDIAN MARINE.

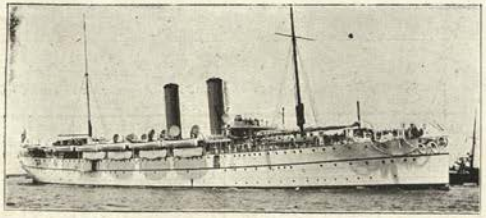
Troop-ships.



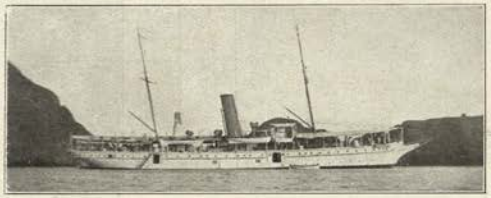
NORTHBROOK (Clydebank, 1907). 5820 tons. Dimensions: 360× 51¾×18 feet. H.P. 7000=16 kts. Armament: 6—4 inch, 6—3 pdrs.



DUFFERIN (Vickers, 1904). 7457 tons. Dimensions: 437×53×19 ft. H.P. 9800=19 kts. Coal: 1200 tons. Armament: 8—4 inch, 8–3 pdrs.



HARDINGE (Fairfield, 1900). 6520 tons. Dimensions: 423½ (*over all*) ×51×19 feet. H.P. 9366=18 kts. Fitted with Howden's forced draught. Armament: 6—4·7 inch, 6—3 pdrs., 4 Maxims.



Photo, W. Ewart Williams, Esq., R.I.M.

MINTO (Birkenhead, 1893). 930 tons gross. Dimensions: 205× 31×— feet. 1670=14 kts.

Photo wanted.

DALHOUSIE (Greenock, 1886). 1960 tons. H.P. 1510=13 kts. Coal: 300 tons. Armament: 6—6 pdrs.

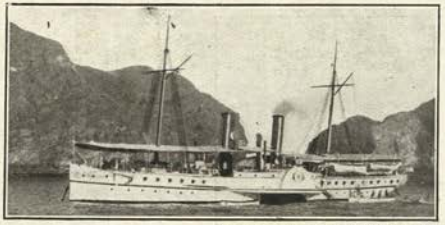


Photo by favour of N. O'Toole, Esq.

LAWRENCE (1886). 1154 tons. Dimensions: 212×32½×18½ feet. Guns: 4—6 pdr., 4 machine. H.P. 1200=13·5 kts. Coal: 270 tons.

Photo, W. Ewart Williams, Esq., R.I.M

INVESTIGATOR (Vickers, 1907). Gross tonnage 1015, net 515. I.H.P. 1500. (*Surveying.*)

BI cone.

AG MINTO.

FH LAWRENCE.

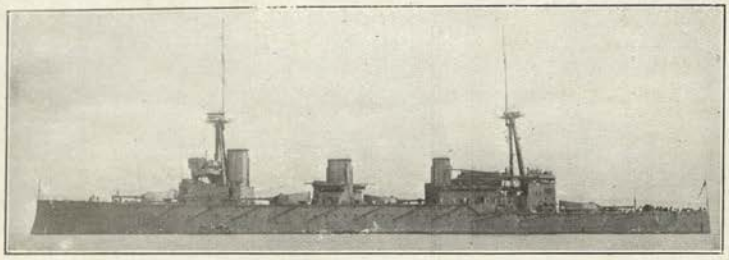
GH NORTHBROOK.

GJ HARDINGE.

GK DUFFERIN.

AUSTRALIAN NAVY.

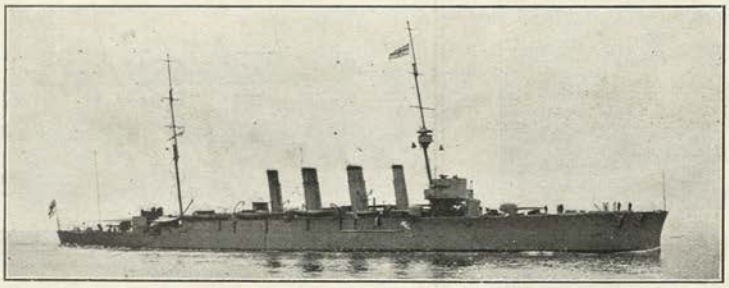
Dreadnought Cruiser.



Photo, Symonds.

AUSTRALIA (Clydebank, 1912). 19,200 tons. 26 kts. Sister to the *Indefatigable*. Babcock boilers. H.P. 44,000. Differs from prototype in a few minor details.

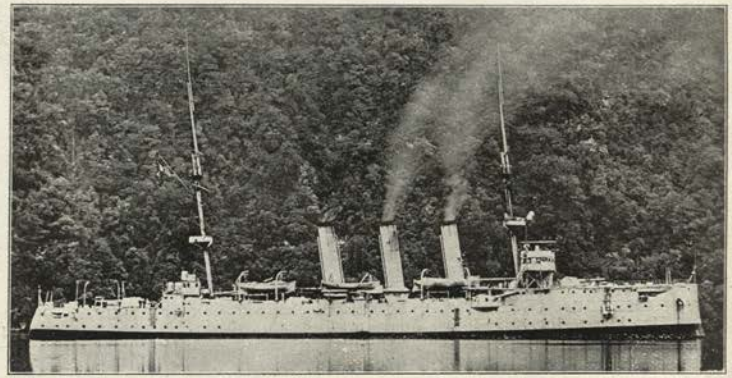
Protected Cruisers.



MELBOURNE. *Photo, Symonds.*

MELBOURNE (1911), **SYDNEY** (1911), & *BRISBANE* (1914). *Dartmouth* type. 5600 tons. Armament: 8—6 inch. Designed H.P. 22,000=26 kts.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Melbourne	Cammell-Laird	Cammell-Laird	1911	'13		Yarrow	
Sydney	L. & Glasgow	L. & Glasgow	1911	'13		"	
Brisbane	Sydney		1912	'15		"	



ENCOUNTER (1902) (*lent* 1912). 5915 tons. Armament: 11—6 inch, 8—12 pdr., 2—18 inch tubes, *sub*. Designed H.P. 10,000=20 kts. Dürr boilers. (See *Challenger*, British).

Destroyers.

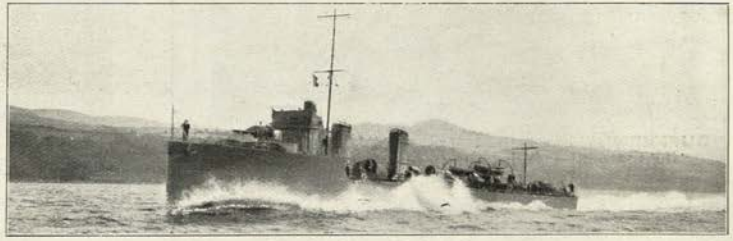


Photo by favour of Messrs. Denny Bros.

Parramatta, Yarra, Warrego (1910), ***Swan, Derwent, Torrens*** (1912-13). Armament: 1—4 inch, 3—12 pdrs 3—18 inch tubes. Radius: 2500 kts. Oil fuel.

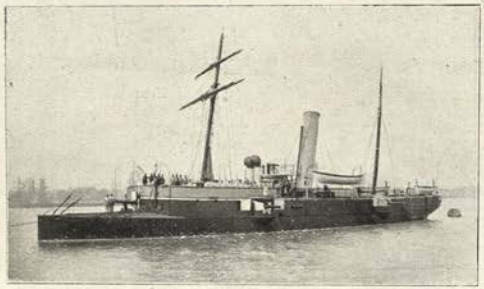
No.	Type	Date	Displacement	H.P.	Speed	Fuel	Complement	Tubes	Max. draug't
			tons		kts.	tons			
3	*Parramatta*	'09-'11	700	t	26	...	66	3	...
3	ditto	'11-'13							

2 Submarines.

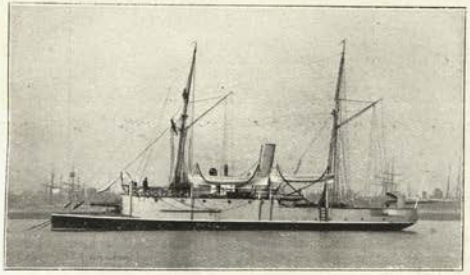
Two *E* class. **AE 1** & **2.** (See British *E* class.)

AUSTRALIAN NAVY—(*Continued*).

Miscellaneous.



PROTECTOR (Elswick, 1884). 920 tons. Guns: 1—old 8 inch, 5—6 inch, 4 Gatlings. H.P. 1600=14 kts. originally. (*South Australia*).



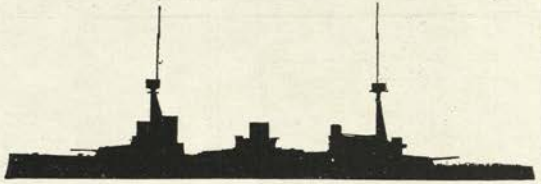
GAYUNDAH & **PALUMA** (Elswick, 1884). 360 tons. Guns: 1—old 8 inch, 1—6 inch, 4 machine. Speed originally: 10·5 kts. (*Queensland*).

AI cone.

BG Gayundah *class.*

BH Protector.

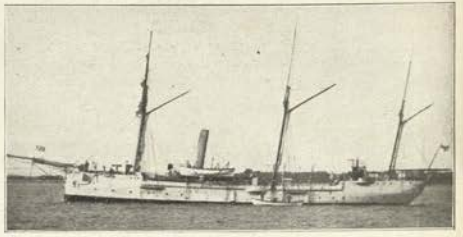
RG Encounter.



P Australia.

NEW ZEALAND.

Gunboat.



AMOKURA (Greenock, 1889). 805 tons. Guns: 6—4 inch, 3—3 pdr. H.P. 1200=13 kts. Coal: 105 tons.
(*Training Service.*)

Miscellaneous.

A yacht, **HINEMOA,** and two small mining vessels. Also cable ship, **TUTANEKAI.**

CANADA.

Note.—There is a 25,000 ton floating dock at Montreal. Dimensions: 600×100×27½ feet.

AG Earl Grey.

BG Lady Grey.

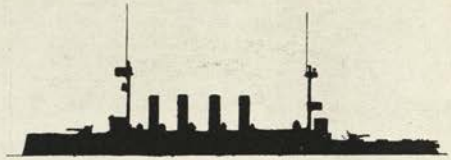
DG Canada.

DH Montcalm.

DI Cartier.

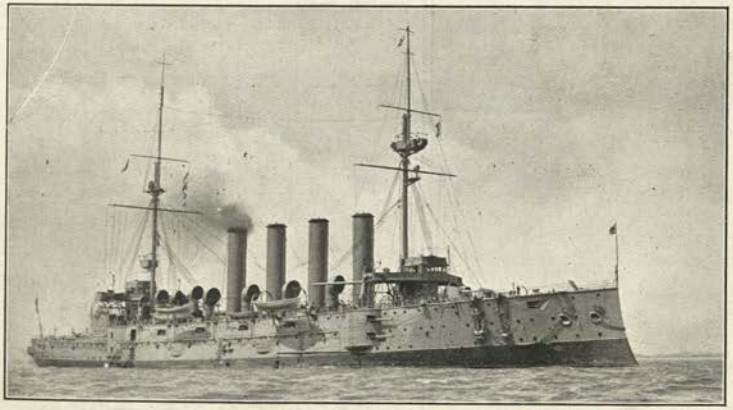
DJ Curlew.

JG Rainbow.



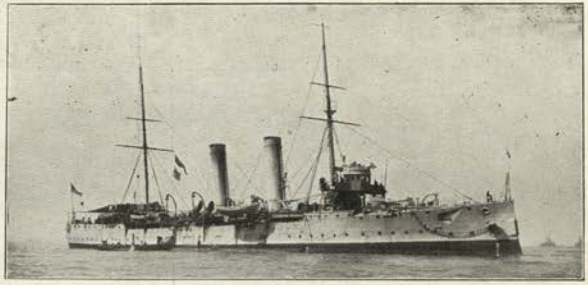
VK Niobe.

Protected Cruisers.



NIOBE (1897). 11,000 tons. Complement 677. Guns: 16—6 inch, wire, 13—12 pdr., 12—3 pdr., 2 Maxims. Torpedo tubes: 2 *submerged*. Armour: Deck, 4″; Casemates, 6″. Designed H.P. 16,500=20·25 kts. Present speed: somewhere about 18 kts.

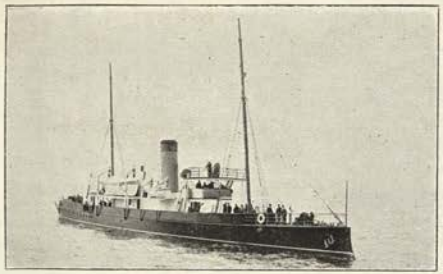
(See *Diadem* class, British).



RAINBOW (1891). (Bought 1909). 3600 tons. Complement 273. Guns: 2—6 inch, 6—4·7 inch, 8—6 pdr., 1—3 pdr. Torpedo tubes: 4 *above water* (14 inch). Deck: 2″. Designed H.P. 9000=19·75 kts. Present speed: about 15-16 kts.

(See *Apollo* class, British).

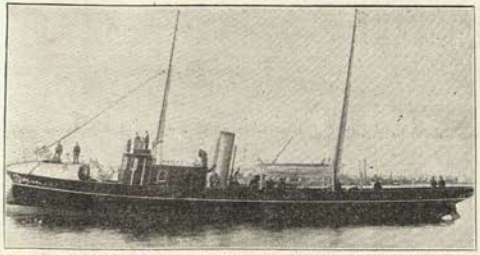
Gun Vessels.



CANADA (Vickers, 1904). 780 tons. Dimensions: 200 × 25 × 14 feet. H.P. 1800 = 17 kts. Guns: 4—3 pdr.

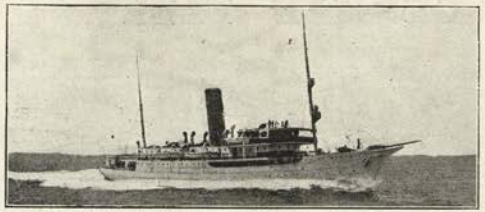
(No photo procurable.)

MINTO (Dundee, 1899). 1100 tons. H.P. 2900 = 16 kts. Guns: 4—6 pdr.



CURLEW (Polson Ironworks, Ontario. 1892), & **CONSTANCE** (Polson's, Ontario, 1891). About 400 tons. Guns: 3 machine. Speed, 11 kts. *Curlew* (*Fishery*). *Constance* (*Revenue*).

Icebreakers, etc.



EARL GREY (Vickers, 1909). 3400 tons. 250 × 47½ × 17¾ feet. H.P. 6000 = 17 kts. (did 18 on trial). Boilers: cylindrical. (*Also used as Vice-Regal Yacht.*)

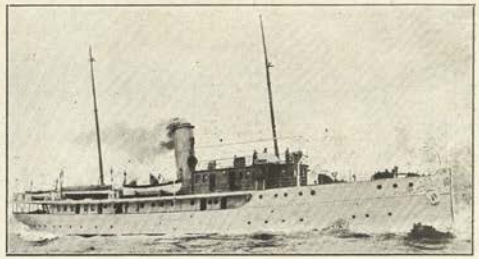
LADY GREY (Vickers, 1906). 1055 tons. 172 × 32 × 18½ feet. H.P. 2300 = 14 kts.

MONTCALM (1904) & **CHAMPLAIN** (1904). 1432 tons. 243 × 40 × 18 feet. H.P. 3600 = 14 kts.

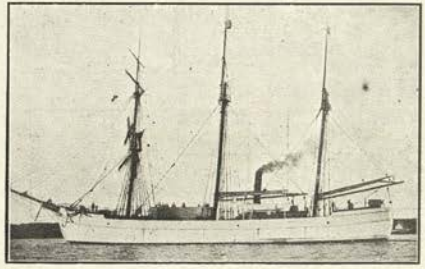
One funnel, two masts.

ACADIA (Chester, Pa, 1880). 526 tons. Guns: 6 machine. Speed, 10·5 kts. (*Fishery.*)

Survey.

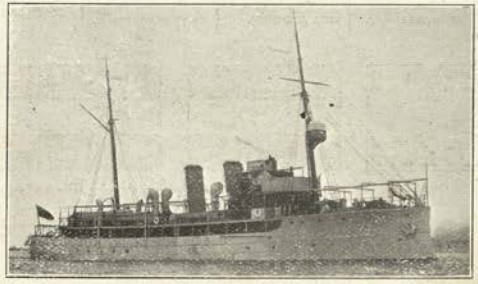


CARTIER (1910). Dimensions: 173 × 29 × 12 feet.



GAUSS (1901).

Customs.



MARGARET (Thornycroft, 1914). Customs Cruiser.

GERMAN FLEET.

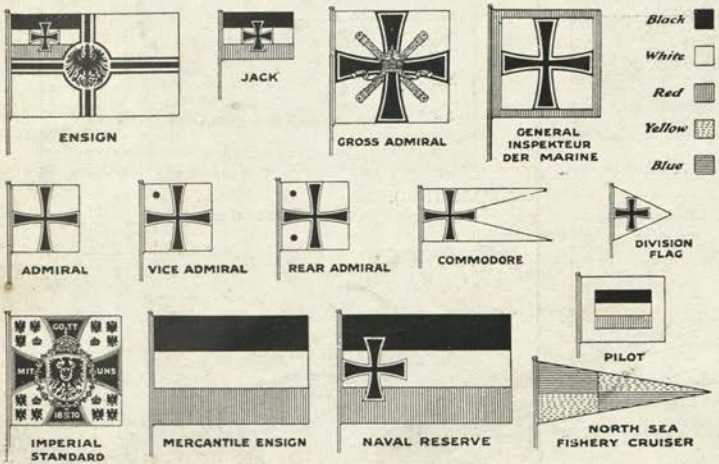
WILHELMSHAVEN to	miles.
Cherbourg	510
Dover	330
Gibraltar	1565
Havre	450
Hull	330
Kiao-chau	11100
Malta	2555
New York	3570
Port Said	3530
Portsmouth	440
Rio de Janeiro	5470
Rosyth	450
Sheerness	280

KIEL to	miles.
Copenhagen	160
Danzig	280
Libau	360
Memel	330
Kronstadt	670
Skaw	240

DANZIG to	miles.
Libau	120
Memel	113
Kiel	280

Wilhelmshaven to Kiel, 80 miles, (by canal much of the way).
„ „ 530 „ (via Great Belt).

Map of German Coast, showing Arsenals and Private Yards, &c.



Imperial standard: Square; yellow, with black cross; Imperial arms in centre and in field.

Mercantile Marine (excluding fishing craft, &c.).

About 2000 steamers, total tonnage nearly 3,000,000.
2700 sailing, total tonnage about 500,000.
Total crews for these ships *circa* 75,000 men.

Principal Trade Ports (with approximate annual clearance).

Hamburg and Cuxhaven (12¼ million tons), Bremen district (1¾ million), Stettin (1½ million), Danzig (Neufahrwasser) (¾ million), and Kiel, Lubeck, and Königsberg (near Memel) all about ¾ to ½ million). Rostock (1 million).

Coinage.

Mark (100 pfennige) = 11¾*d.* British, 24 cents U.S.A.

Colour of Ships.

Big ships: light grey all over; distinguishing bands on funnels.
Torpedo craft: varies from black to dull brown.

Active Naval *Personnel* for 1914.

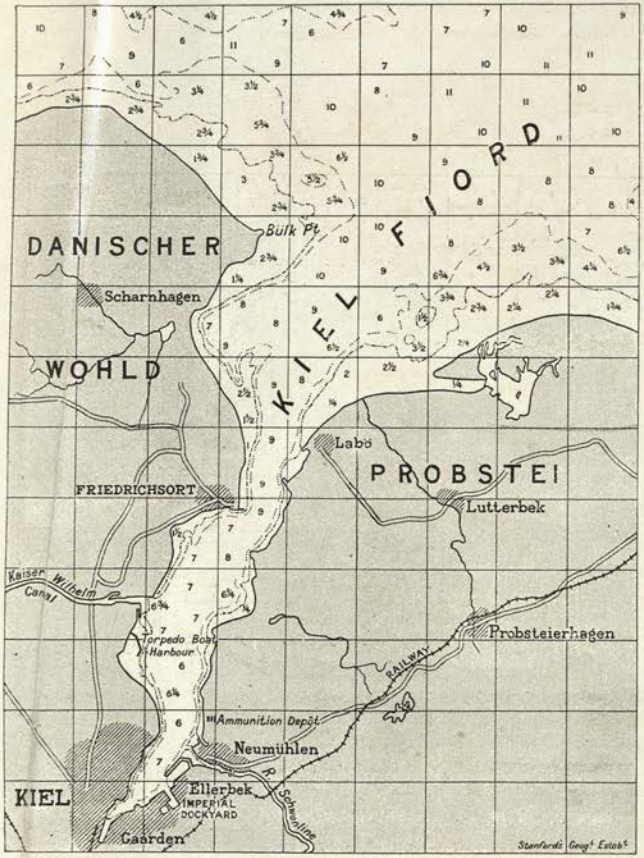
79,080 (including 1,382 marines). (Increase of 6,191 over 1913). Also about 110,000 Reserve.

Dreadnought Docks.

Wilhelmshaven 5. Kiel 3. Private 3. Others pro. or building.

GERMAN DOCKYARDS.

(Divided into 2000 yard squares. Uniform scale. Soundings in fathoms. Height in feet).



KIEL mercantile trade about 550,000 tons of shipping cleared annually.
Admiralty Chart No. 33.

1. **KIEL.** Two large basins.

Docks:
(1) 423×71 ×28
(2) 382×70 ×25½
(3) 362×64½×22½
(4) 344×67 ×16
(5) 570×94 ×30
(6) 570×94 ×30

Also one floating dock (40,000 tons), 570 × 96 × 35 feet, and five small floating.

Another 40,000 ton floating *pro.*

Two building slips.
(1) 427 feet.
(2) 427 feet.

Men employed, *about* 10,000.

Machinery: 109 of 23,240 H.P.

2. **WILHELMSHAVEN.** Two large basins. Harbour for torpedo craft inside yard.

Docks:
(1) 438×72 ×27½
(2) 438×72 ×27
(3) 370×61½×22
(4) 584×101×35
(5) 584×101×35
(6) 584×94 ×35
(7) 822×131×34
(8) 822×114¾×34

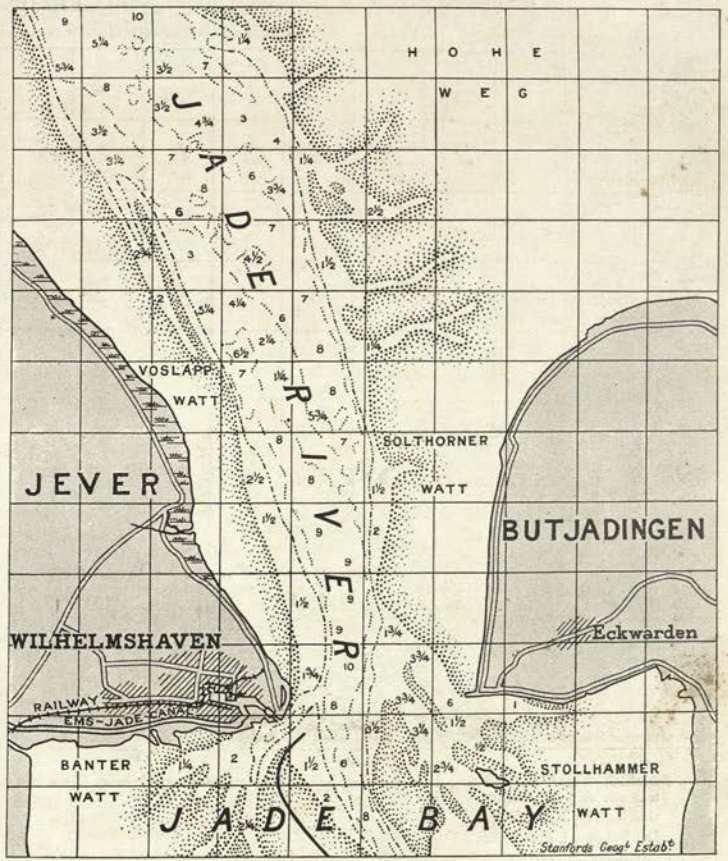
Five floating docks and 4 pontoons for torpedo boats.

Two 35,000 ton floating docks *pro.*

Four building slips, (1) 600 feet, (2) 345 feet), (3) 300 feet, (4) about 600 feet.

Men employed, *about* 11,000

Machinery: 38 of 9300 H.P.



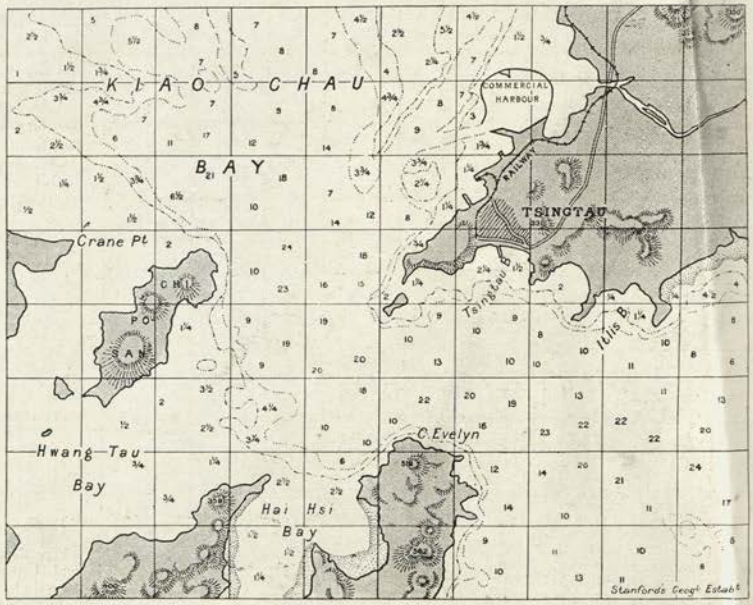
WILHELMSHAVEN.
Admiralty Chart No. 3346. Rise of Spring Tide, 11¼ feet.

Note.—Wilhelmshaven Harbour has to be dredged continually on account of the sand which silts up very badly.

GERMAN ARSENALS, ETC.

(Divided into squares of 2000 yards. Uniform scale. Soundings in fathoms. Heights in feet).

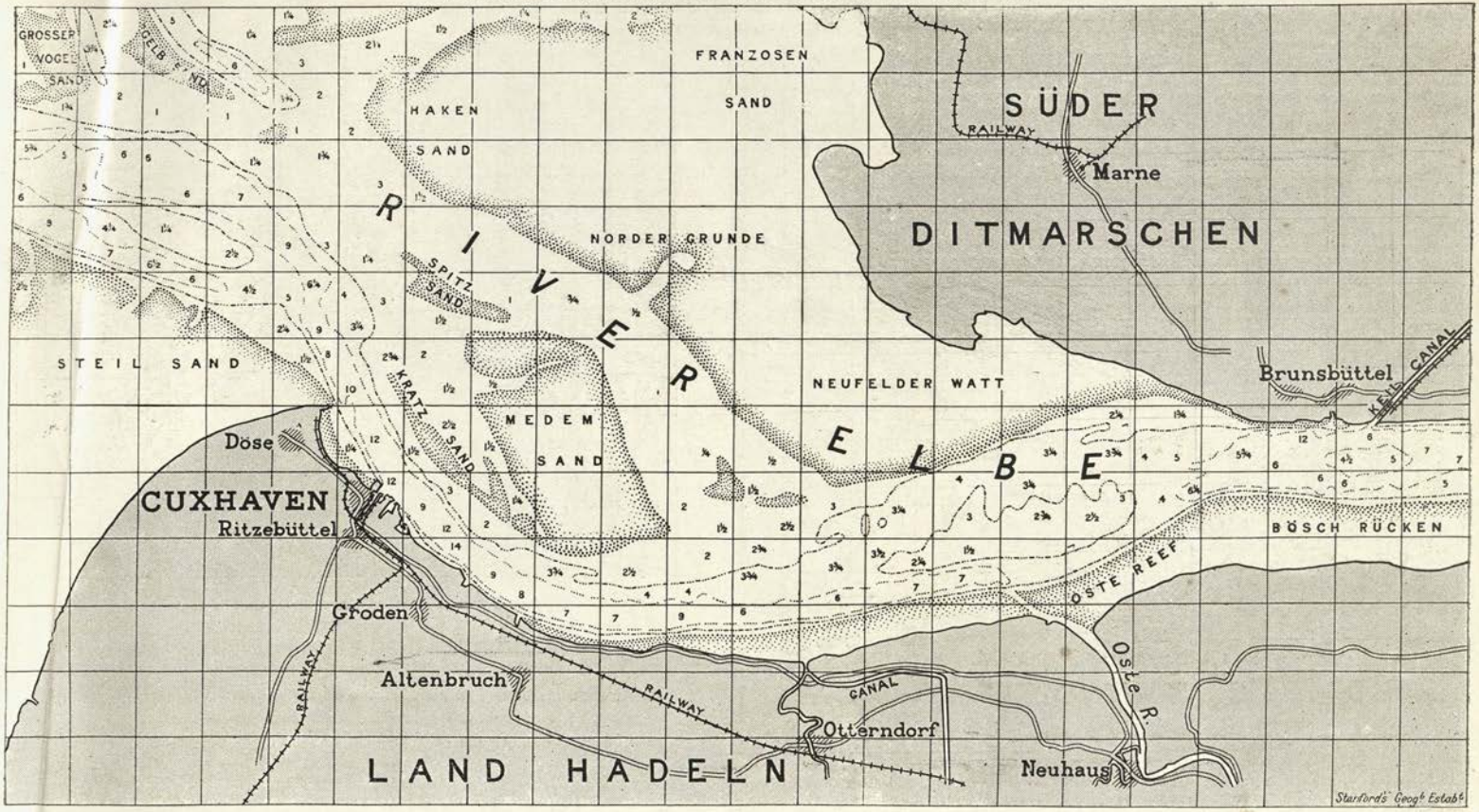
3. **DANZIG.** Three small floating docks and three patent slips. All for torpedo craft. New dock to take any ship (*to be built*).
One building slip (328 feet).
Men employed, *about* 4000.
Machinery: 13 of 1355 H.P.
NEUFAHRWASSER and DANZIG trade about 850,000 tons of shipping cleared annually.
Admiralty Chart No. 3503.



4. **KIAO-CHAU** (China). Fortified base for Far Eastern Squadron
Floating dock 410×98×30 feet.

GERMAN HARBOURS.

(Divided into 2000 yard squares. Uniform scale. Soundings in fathoms. Heights in feet).



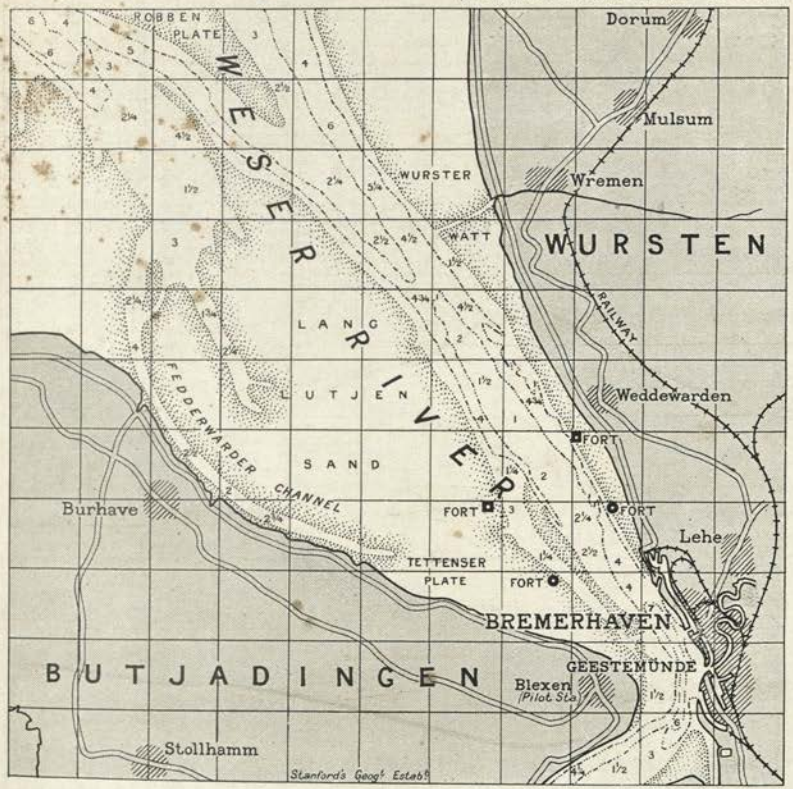
CUXHAVEN (New Naval base) and entrance to Kiel canal.

CUXHAVEN. Port for Hamburg, which is 65 miles from the sea, and headquarters of the H.A.P.A.G. (Hamburg-American Line). Trade of Hamburg and Cuxhaven totals about 9,500,000 tons of shipping cleared per annum. 11 docks in Hamburg district. Floating dock: 750×88×35 feet and one other floating dock (Blohm and Voss) able to take the largest ships, *if sufficiently lightened*. The others available only for small cruisers. Very strongly fortified. A dredged channel for destroyers is believed to exist north of Medem Sand.

Admiralty Chart No. 3261 Rise of Spring Tide, 10¼ feet.

GERMAN HARBOURS.

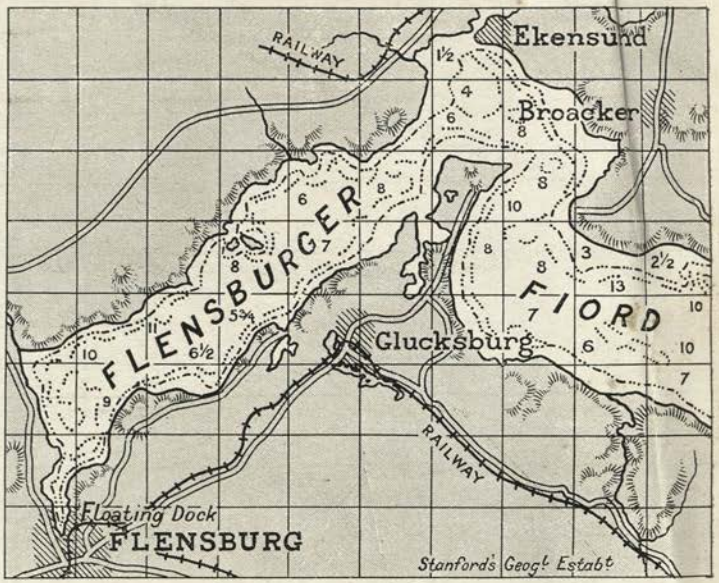
(Divided into 2000 yard squares. Uniform scale Soundings in fathoms. Heights in feet).



BREMERHAVEN. Port for Bremen, which is 50 miles inland of river mouth, and about 28 miles from Bremerhaven. At Bremen are the headquarters of the N. Deutscher Lloyd, and the big shipbuilding firm, Weser Act-Gesellschaft. Trade of the district (Bremerhaven, Vegesack, etc. included) is about 2,750,000 tons of shipping cleared annually.

There are several dry docks at Bremerhaven and Geestemünde, the largest 774×91×23 feet. Another (N.D.L. floating) 450×58×19½ feet and three smaller.

Admiralty Chart No. 3346. Rise of Spring Tide, 10¾ feet.



Principal Private Yards. (North Sea Yards.)

1. BLOHM & VOSS (Hamburg). Ten *Slips* (four 600 feet long, five each about 500 feet long and one slip 328 feet).
   Five *Docks* (floating). (1) 320×52×18 (2) 355×52×18. (3) 558×88×25. (4) 595×88×25. (5) 728×123×36 feet (46,000 tons).
   Employés, 10,000. *Machinery*, 10000 H.P.
2. WESER (Bremen). Five *Slips* (one of 650 feet, one of 490 feet, two of 328 feet, one small). Three *Docks* (floating) of small size.
   Employés, 6000. *Machinery*, 4220 H.P.
3. BREMER-VULKAN (Vegesack). Six *Slips* (one of 650 feet, two about 530 feet, three smaller).
   Docks: one floating.
   Employés, about 3100. *Machinery*, 2800 H.P.
4. VULCAN (Hamburg). Two *Slips*, 650 feet or so. One floating dock, 610×108×28 (26,000 tons), two smaller, one large (building). *Employees* about 9000. H.P. 6500.
5. TECKLENBORG (Geestemünde). Six *Slips* (two of 600 feet, two about 500 feet, two smaller. 3000 men. H.P. 3400. Two dry docks.
6. REIHERSTIEG A.G. (Hamburg). One *Slip* about 550 feet, one about 400, five small.
   Docks (floating): one 511½×97×26 feet (20,000 tons), three smaller.
   Employes about 2000. H.P. about 4000.

SWINEMUNDE. Port for Stettin, which is 36 miles up the river. Trade of Stettin and Swinemunde is about 1,300,000 tons of shipping cleared annually. No docks here suitable for large warships.

Principal Private Yards—Continued. (BALTIC YARDS).

HOWALDT (KIEL). Ten *Slips* (one about 650 ft., one about 500 ft., six smaller). *Docks*: one floating. *Employés*, about 3700. *Machinery*,

KRUPP'S GERMANIA (KIEL). Six *Slips* (two about 650 feet, the rest smaller). One of 650 feet building. 6400 *Employés*. *Machinery*, 4000 H.P. *Docks*: none.

SCHICHAU (ELBING). Twenty-one *Slips* (six over 650 feet long, the others all small). Two *Docks* (floating) for torpedo craft. *Employés*, about 7000. *Machinery*: 5000 H.P.

SCHICHAU (DANZIG). Six *Slips* (one over 650 feet, three about 500 feet, two smaller). *Docks*: four floating. *Employés*, about 5000. *Machinery*: about 2000 H.P.

VULCAN (STETTIN). Seven *Slips* (two over 650 feet, two about 500 feet, three about 350 feet or so). Two *Docks* (floating). (1) 302×52×15 feet. (2) 510×62×24 feet. *Employés*, 6800.

G cone. GERMAN WARSHIPS (ONE FUNNEL) SILHOUETTES.

AB VATERLAND *class* (*river gunboats*).

AC DELPHIN (*tender*).

AD FUCHS (*tender*).

WÜRTEMBERG (*school ship*).

BH VULKAN (*special submarine ship*). (*Twin funnels*).

BI PLANET (*survey*).

CH HAI (*tender*).

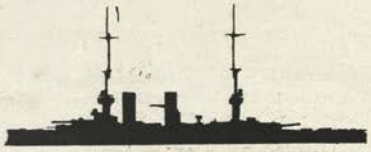
DH PELIKAN (*mines and torpedo depôt*).

EH SEE ADLER *class* (*page* 142) (3 ships).

EI GEIER (*page* 142).

GERMAN WARSHIPS (TWO FUNNELS) IDENTIFICATION AND SIGNAL SILHOUETTES.

HI Kaiser Friedrich *class* (*page* 127).

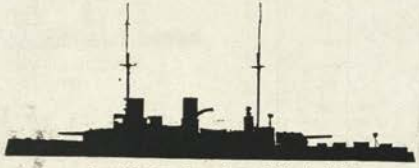


HJ Wittelsbach *class* (*page* 127) (5 ships).

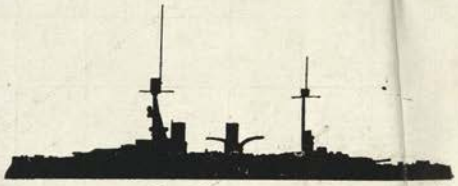
HK Fuerst Bismarck (*page* 133).

HL Prinz Heinrich (*page* 132).

H Seydlitz (*page* 122).



I Nassau *class* (*page* 120) (4 ships).



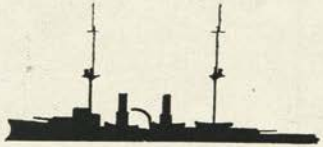
IJ Blücher (*page* 129).

J Von der Tann (*page* 124).

K Moltke *class* (*page* 123).

LH Brandenburg *class* (*page* 128).

LJ Siegfried *class* (*page* 128) (8 ships).

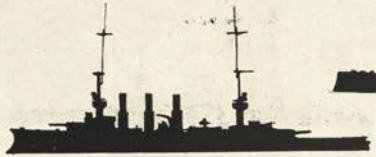


LK Hertha *class* (4 ships). (*page* 133).

L Kaiser *class* (*page* 118).

NH Braunschweig *class* (*page* 126) (5 ships).

NI Deutschland *class* (*page* 125) (5 ships).
(Compare funnels with Braunschweig)

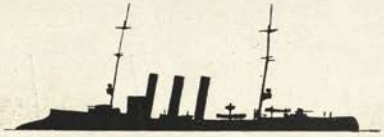


NJ Prinz Adalbert *class* (*page* 132) (2 ships).
(Much lighter than battleships in appearance).

N Helgoland *class* (*page* 119) (4 ships).

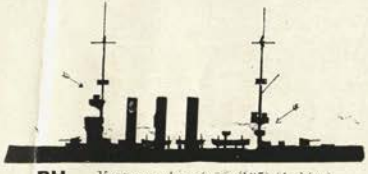
NK Freya (*page* 134).

NL Gefion (*page* 140).

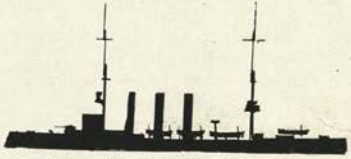


OI Bremen *class* (*page* 138) (8 ships).

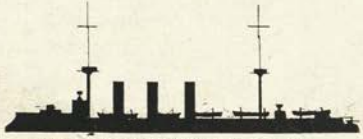
OJ Danzig & Leipzig (*page* 137).



PH Kolberg *class* (*page* 135) (4 ships).



PI Dresden & Emden (*page* 136).

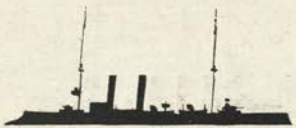


QH Kaiserin Augusta (*page* 134).

PK Koenigsberg (*page* 137).

PL Stettin *class* (*page* 136) (3 ships).

IH FRAUENLOB *class* (*page* 138) (3 ships).
(Fatter funnels than Gazelles')



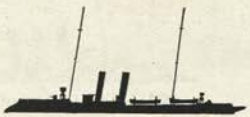
IK NYMPHE *class* (*page* 139) (5 ships), and NIOBE
(Shorter than Frauenlobs, and thinner funnels).

IL GAZELLE (*page* 139).
(Conning tower and bridge between funnels).

JH ALBATROSS (*mine layer*).

JI LUCHS *class* (4 ships).

IQ JAGUAR *class* (2 ships).



BLITZ *class* (*subsidiary*).

IM HELA.

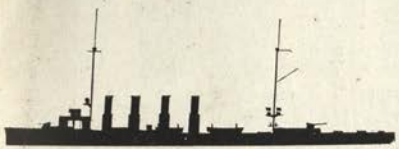
LM NAUTILUS (*mine layer*).

DRACHE (*tender*).

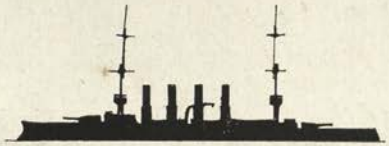
OTTER (*river gunboat*).

LS HOHENZOLLERN (*yacht*).

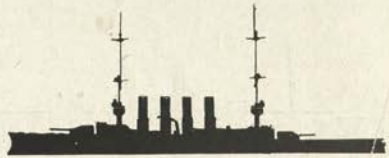
GERMAN WARSHIPS (FOUR FUNNELS) IDENTIFICATION AND SIGNAL SILHOUETTES.



UH Breslau & Karlsruhe *class* (*pages* 134 & 135) (8 ships).



VI Roon *class* (*page* 131) (2 ships).



VJ Scharnhorst *class* (*page* 130) (2 ships).

GERMAN TORPEDO CRAFT—IDENTIFICATION AND SIGNAL SILHOUETTES.

A t.b. T 73—43.

B t.b.d. D 6.

H t.b.d. D 9—7 & 5—3.

G t.b. G 88–89.

t.b.d. G type. (older boats) t.b.d. S type.

I

J t.b.d. D 10.

K t.b.d. Taku.

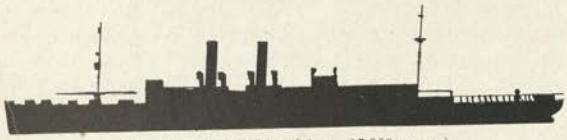
t.b.d. V type.

Latest type t.b.d.

G 173—169.

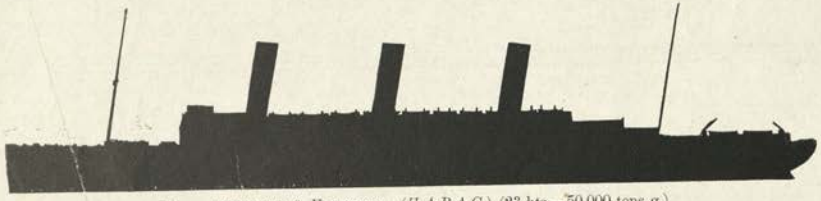
t.b.d. G 197—172.

L

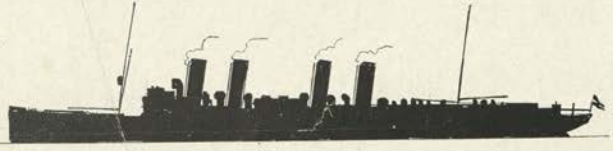


H Berlin (*N.D.L.*) (18 kts.—17,300 tons g.)

I George Washington (*N.D.L.*) (19 kts.—27,000 tons g.)



N Imperator & Vaterland. (*H.A.P.A.G.*) (23 kts.—50,000 tons g.)



R Kaiser Wilhelm der Grosse (*N.D.L.*) (23 kts.—14,350 tons g.)
Kronprinz Wilhelm (*N.D.L.*) (23·4 kts.—15,000 tons g.)

T Kaiser Wilhelm II. (*N.D.L.*) (23·5 kts.—19,300 tons g.)
Kronprinzessin Cecilie (*N.D.L.*) (23·5 kts.—19,500 tons g.)

INSIGNIA OF RANK ON SLEEVES FOR EXECUTIVES (See Offizierkorps).

Admiral. | Vizeadmiral. (Vice-Ad.) | Kontreadmiral. (Rear-Ad.) | Kommodore (Commodore). | Kapitän zu See. and Fregatten-Kapitän (Captain). | Korvetten-Kapitän. (Commander) | Kapitän-Leutnant. Senior Lieut.) | Oberleut z. See. (Junior Lieut.) | Leutenant z. See (Sub-Lieut.)

Note.—Torpedo officers are without the crown on sleeve, as also are all civilian branches. Engineer officers given same official status as Executive, July, 1908.

Torpedo officers have between the gold stripes, *brown*; Engineers, *black*; Doctors, *blue*; Paymasters, *light blue*; Constructors, *black*.

(The colour of the branch is also worn on the epaulettes, full dress, and worked into the shoulder straps).

Paymasters and constructors have silver instead of gold epaulette fringes, and cloth instead of velvet between the stripes.

Torpedoes.

	Name or Mark.	Air Pressure.	Charge.	Max. Range.	Average speed if set for			
					1000	2000	4000	7000
inch.		*about*	lbs.		kts.	kts.	kts.	kts.
22	Model '10	...	300	...	38½	...	35	...
20	Model '07	...	...	7000	36	32	20	...
17·7		2000	246½	2000	30	26		
13·7		2000	100	2000	28	20		

The 22 inch and 20 inch are hot air. The 22 inch has two propellers.

Submerged tubes are axial, broadside, and 45° abaft the beam. Type of early model tube somewhat similar to the Elswick.

Some experimental submerged training tubes fitted 1907, but so far have proved impracticable and unless improvements can be made to them will be replaced by fixed tubes.

Funnel Marking System.

All ships are marked according to position they take in squadron. 4 colors are used, in following order: White, Red, Yellow, Blue.

A "Flotte" consists of 16 ships = 2 "geschwader" of 8 ships = 4 "gruppen" of 4 ships. This for battleships Cruiser squadrons = "Aufklarungsgruppen," consist of 4, 5 or 6 ships to a "gruppe."

Each "gruppe" of a "Flotte" has a separate color. The flagship of a "gruppe" has 1 band of its color.

A "Flotten" flagship has no markings, and this is deducted from Blue "gruppe," when a "Flottenflagschiff" exists.

1 2 3 4

Principal Naval Guns (Krupp).

Note.—The following particulars, though differing considerably from those usually current, are believed to be approximately correct.

Notation.	Calibre.	Usual Naval Designation.	Length in cals.	Date of Model.	Weight of Gun.	Weight of A.P. shot.	Initial Velocity.	Maximum penetration (direct impact) against K.C. at 9000 yds.	at 6000 yds.	at 3000 yds.	Danger space against average ships at 10,000	5000	3000	Approximate Muzzle Energy.
	inch.	c/m.			tons.	lbs.	F.S.	in.	in.	in.	yards	yards.	yards.	foot tons.
A^{9*}	15	*"36"*	45	'13	...	1367	2296	16	18½	21	...	...	...	80,500
A^{7*}	12	*"31"*	50	'10	53	1014	2500	12	15	18	...	..	...	51,000
A^{6*}	12	*"31"*	45	'09	48	981	2500	11	14	17	210	640	1000	45,500
A^{5*}	11	*28*	50	'10	41½	760	2500	8½	13	16	...	...	...	43,000
A^{4*}	11	*28*	45	'04	40	675	2296	7	12	15	170	580	950	39,000
A^{3*}	11	*28*	40	'01	34	595	2231	6	10	14	150	450	740	28,000
A^{2*}	9·4	*24*	40	'99	21	352	2885	4	8	12	130	400	700	13,000
A^{*}	9·4	*24*	40	'98	21	309	2552	3½	7	10	110	350	620	12,500
A^{2*}	8·2	*21*	45	'09	15½	320	2753	5	7	11	120	...	...	16,500
A^{2*}	8·2	*21*	45	'04	17	309	2360	4	6½	10	...	...	...	12,000
A^{*}	8·2	*21*	40	'01	16	242	2379	3	6	9	...	...	...	11,000
B^{*}	6·7	*17*	40	'01	8	132	2880	...	3	5	80	240	460	...
C^{*}	6	*15*	45	'09	5½	112	3087	...	...	5	...	200	420	...
E^{*}	6	*15*	40	'01	5	90	2379	...	...	3½	...	140	350	...

* Brass cartridge cases to *all* guns.

Lesser guns: 4·1 inch (*105* m/m) firing a 31 lb. projectile; 3·5 inch (88 m/m) firing 25 lb. projectiles in modern and 15½ lb. in old models; and a 3 inch (75 m/m) 14 pdr. anti-aerial gun.

Projectiles: Guns of 11 inch and over fire an "all purposes" projectile—an A.P. shell with a very considerable H.E. burster and a special fuse, the secret of which has been very carefully guarded.

The 1899 and later models have the recoil utilized to return the gun to firing position for pieces over 6-in. In 6-in. compressed air is employed. German guns have a lower muzzle pressure than normally obtains.

12 inch, 50 cal. *Kaiser* class, 12 inch, 45 cal. in *Helgolands* (4).

11 inch, 50 cal. *Moltke* and *Seydlitz* classes, 11 inch, 45 cal. in *Nassaus* (4), and *Von der Tann*.

11 inch, 40 cal., M'01 in *Deutschland* (5) and *Braunschweig* (5) classes.

9·4, 40 cal., M'99 in *Wittelsbach* class (5), *Bismarck* and *P. Heinrich*, older model *K. Friedrich* class.

8·2, 45 cal., *Blücher* only.

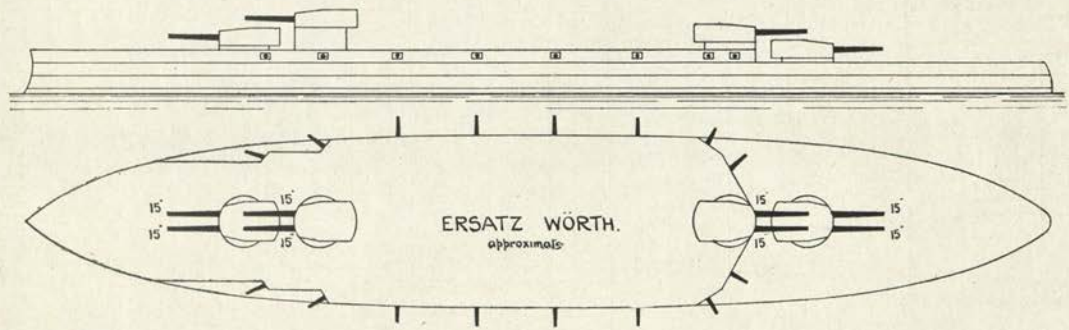
ERSATZ K. FRIEDRICH III, ERSATZ WÖRTH (building), & "T" (building).

Displacement, *about* 28,000 tons. *Full load*, 30,000 tons. Complement, .

Length, feet. Beam, feet. *Mean* draught, feet.

Guns:
8—15 inch.
16—6 inch.
12 smaller, high-angle.
Torpedo tubes (22 inch).

Armour (Krupp):
" Belt (amidships) ... .*aaaaa*
„ (ends)..... ....



Machinery: Turbine. Boilers: Schulz-Thornycroft. screws. Designed H.P. = 23 kts. (*about*).
Coal: *normal*, 1000 tons; *maximum*, 4800 tons. Also oil.

Armour Notes. –

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Best recent speed*
E. Wörth	Schic'au, D'nz'g	Schichau	Ap'l '13	*'16*	=	...	...
"T"	Howalt, Kiel	Howalt	May '13	*'16*	=	...	...
E. K. F. III.	...	...	'14	*'17*	=	...	...

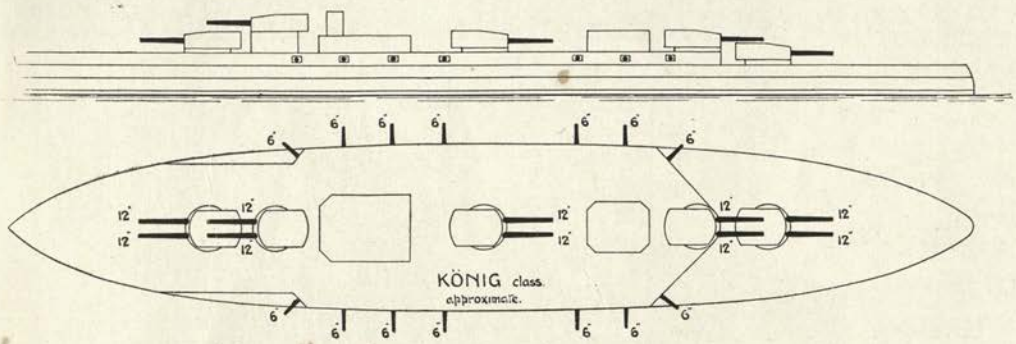
ERSATZ WEISSENBURG (1913), **GROSSER KURFÜRST** (May, 1913), & **KOENIG** (March, 1913), **MARKGRAF** (June, 1913).

Displacement, *about* 25,500 tons. Complement, *about* 1100.

Length, *about* 580 feet *over all*. Beam, *about* 96 feet. *Mean* draught, *about* 27½ feet.

Guns:
10—12 inch, 45 cal.
14—6 inch.
12—24 pdr.
4—14 pdr. anti-aerial
Torpedo tubes (20 inch):
4 (broadside) *submerged*.
1 (stern) *submerged*.

Armour (Krupp):
14″ Belt (amidships)...*aaaaa*
″ Belt (bow) .....
″ Belt (stern) .....
Protection to vitals (*see notes*):
12″ Turrets .....
8″ Battery .....



Machinery: 3 sets turbine (see table). Boilers: Schulz-Thornycroft. Designed H.P. 34,000=21·5 kts. Coal: *normal*, 1000 tons; *maximum*, 4400 tons. Also 700 tons oil. 3 screws.

Gunnery Notes.—There are 2 conning towers, 4 special armoured fire control towers, one torpedo control tower.

Armour Notes.—Funnels, 6 inch armour to height of 20 feet above upper deck. Special under water 3 inch plating for length of 350 feet amidships. Internal protection as for *Kaiser* class.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Best recent speed*
Markgraf	Weser, Bremen	Weser	Oct. '11	Oct. '14	=	Bergmann	...
G. Kurfürst	Vulkan, H'b'g	Vulkan	May '11	Oct. '14	=	A.E.G. (Curtis)	...
Koenig	W'l'mshav'n Y.	...	Sept. '11	Oct. '14	=	Parsons (mod.)	...
E. Weissenburg	Krupp	Krupp	Ap'l '12	July '15			

First three belong to the 1911 programme, *Markgraf* to the 1912.

General Notes.—It was originally intended to fit Diesel motors to the centre engine; but this was subsequently abandoned.

1909-10 GERMAN DREADNOUGHTS. Nos. 11, 12, *also* 14, 15, 16

(Kaiser Class—5 Ships.)

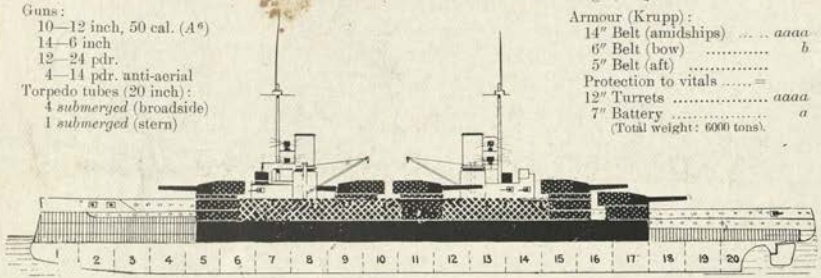
KAISER (March, 1911), **FRIEDRICH DER GROSSE** (June, 1911), **KAISERIN** (Nov., 1911), **PRINZ REGENT LUITPOLD** (Feb., 1913) & **KONIG ALBERT** (April, 1912).

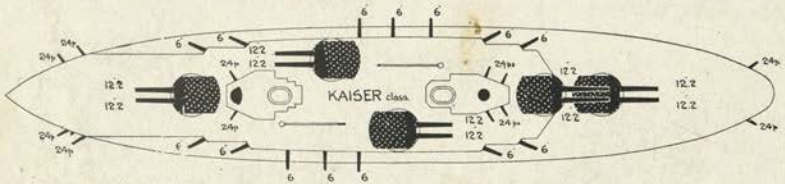
Displacement, 24,700 tons. Complement, 1088.

Length (*waterline*), 564 feet. Beam, 95¼ feet. *Maximum* draught, 27¼ feet.

Guns:
10—12 inch, 50 cal. (A^6)
14—6 inch
12—24 pdr.
4—14 pdr. anti-aerial
Torpedo tubes (20 inch):
4 *submerged* (broadside)
1 *submerged* (stern)

Armour (Krupp):
14" Belt (amidships) ..... *aaaa*
6" Belt (bow) ..... *b*
5" Belt (aft) .....
Protection to vitals .....=
12" Turrets ..... *aaaa*
7" Battery ..... *a*
(Total weight: 6000 tons).





Machinery: Turbine (Parsons). 3 screws. Boilers: Schulz-Thornycroft. Designed H.P. 25,000 = 20 kts. Coal: *normal* 1000 tons; *maximum* 3600 tons. Oil: *about* 200 tons.

Gunnery Notes.—Fire controls on turret tops: also towers. Special improved mountings for big guns. Hoists to the 6 inch deliver 9 rounds a minute.

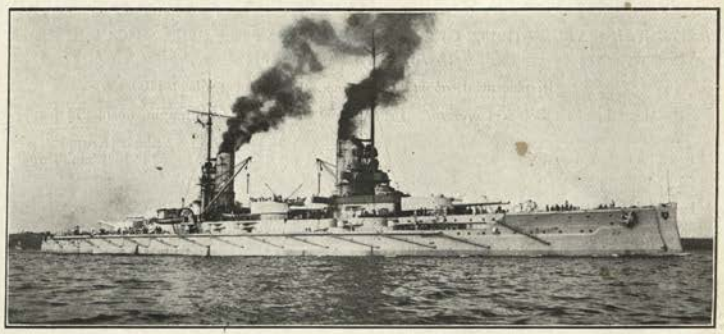
Torpedo Notes.—Bullivant net defence fitted.

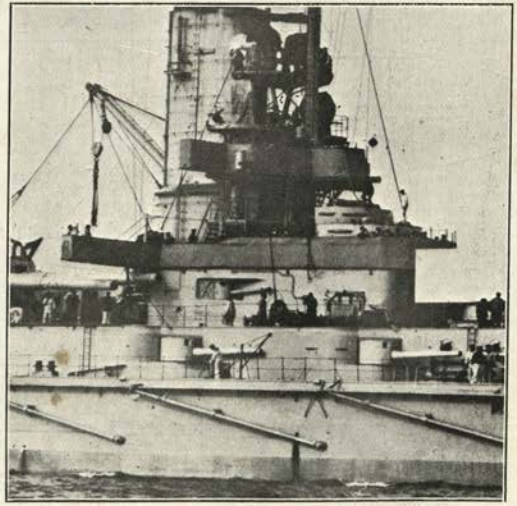
Armour Notes.—Under water protection consists of double longitudinal bulkheads: the outer one 2½ inch, the inner 1¼ inch. The outer bulkhead is 9 feet away from ships side. Minute sub-division: all bulkheads solid. The upper deck is possibly armoured against attacks from aircraft, but no details are available.

Name.	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials* *6 hrs.*	*mean*	*1 hr.*	*Boilers*	*Best recent speed*
Kaiser	Kiel Yard		Oct. '09	Oct. '12	31,516 = 22·3	35,100 = 23·46		Schulz-Thornycroft in all.	23·6
Friedrich der G.	Vulcan, H'b'g	Vulcan Co.	Oct. '09	Oct. '12	31,721 = 21·4	42·113 = 23·8			
Kaiserin	Howalt	Howalt	July, '10	Aug. '13					
K. Albert	Schichau	Schichau	July, '10	Aug. '13					
P. R. Luitpold	Krupp	Krupp	Apl '10	Aug. '13					

General Notes.—First two, 1909 programme; the others, 1910 programme. They have *four* bilge keels. The *Kaiser's* 23·6 was for one hour. Average cost, £2,400,000 per ship.

Note.—This class consists of five ships instead of the usual four. Usual anti-rolling tanks.





(Helgoland Class—4 Ships).

THÜRINGEN (Nov., 1909), **HELGOLAND** (Sept., 1909), **OSTFRIESLAND** (Sept., 1909), **OLDENBURG** (June, 1910).

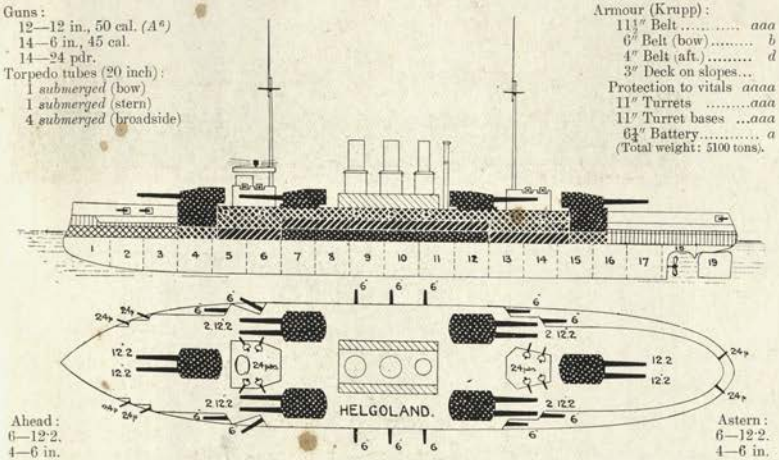
Normal displacement, 21,000, *full load* 22,800 tons. Complement, 1106.

Length (*waterline*), 546 feet. Beam, 93½ feet. *Maximum* draught, 29½ feet.

Guns:
12—12 in., 50 cal. (*A*[6])
14—6 in., 45 cal.
14—24 pdr.

Torpedo tubes (20 inch):
1 *submerged* (bow)
1 *submerged* (stern)
4 *submerged* (broadside)

Armour (Krupp):
11¾″ Belt .... *aaa*
6″ Belt (bow)..... *b*
4″ Belt (aft.)..... *d*
3″ Deck on slopes...
Protection to vitals *aaaa*
11″ Turrets .....*aaa*
11″ Turret bases ...*aaa*
6¾″ Battery..... *a*
(Total weight: 5100 tons).



Ahead:
6—12·2.
4—6 in.

Astern:
6—12·2.
4—6 in.

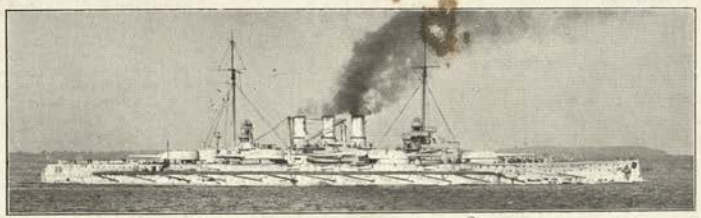
Broadside: 8—12·2 in., 7—6 in.

Machinery: Reciprocating. 3 screws. Boilers: Schulz-Thornycroft. Designed H.P. 28,000 = 20·5 kts.
Coal: *normal* 900 tons; *maximum* 3,000 tons, including oil.

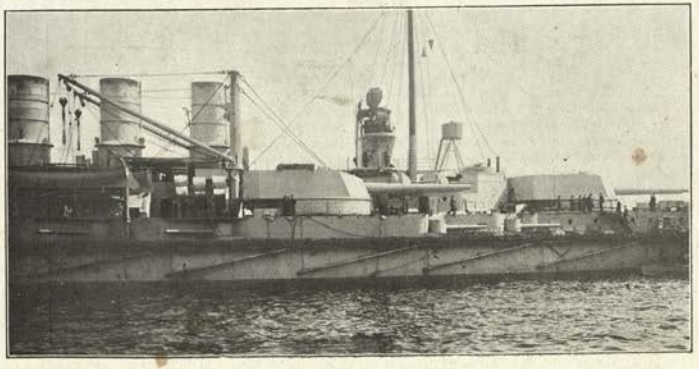
Engineering Notes.—125 r.p.m. = 21 kts. *about.*

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
				To be			
Thüringen	Weser, Bremen	Weser	June '08	June '11	34,944 = 21·075	Schulz-Thornycroft oil.	21·2
Helgoland	Howalt, Kiel	Howalt	Dec., '08	Aug. '11	31,258 = 20·81		22
Ostfriesland	W'mshaven Y		July, '08	Aug. '11	34,944 = 21·10		21·39
Oldenburg	Schichau	Schichau	Mar., '09	Aug. '12	35,000 = 21·4		22·2

General Notes.—First three, 1908 programme; fourth ship, 1909 programme. Frahm tanks fitted. All four ships are extremely good sea boats.



Helgoland.

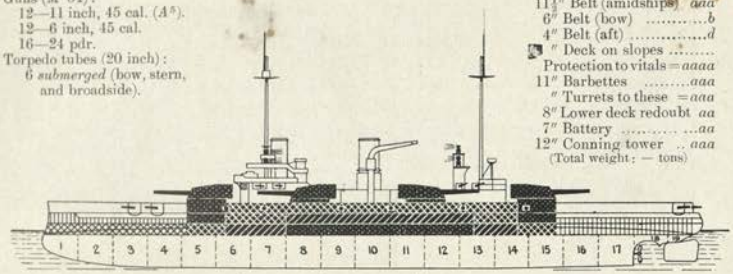


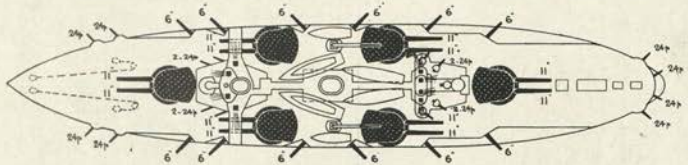
1907 GERMAN DREADNOUGHTS (*Linienschiffe*). 4, 3, 2, 1

WESTFALEN (July, 1908), **NASSAU** (March, 1908), **POSEN** (Dec., 1908) & **RHEINLAND** (Sept., 1908).
Normal displacement, 18,900 tons. Complement, 963.
Length (*waterline*), 470 feet. Beam, 89 feet. *Max.* draught, 27½ feet. Length *over all*, 472 feet. (Length *p.p.*, 451½ feet).

Guns (M '04):
12—11 inch, 45 cal. (*A*[s]).
12—6 inch, 45 cal.
16—24 pdr.
Torpedo tubes (20 inch):
6 *submerged* (bow, stern, and broadside).

Armour (Krupp):
11½″ Belt (amidships) *aaa*
6″ Belt (bow) .....*b*
4″ Belt (aft) .....*d*
″ Deck on slopes .....
Protection to vitals = *aaaa*
11″ Barbettes .....*aaa*
″ Turrets to these = *aaa*
8″ Lower deck redoubt *aa*
7″ Battery .....*aa*
12″ Conning tower .. *aaa*
(Total weight: — tons)



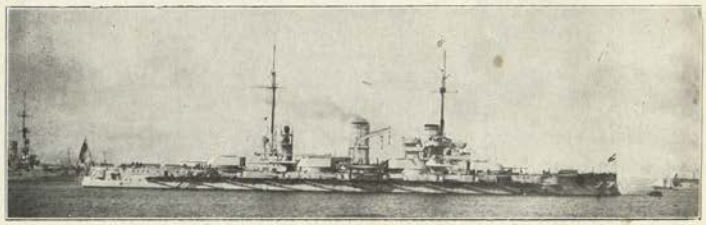


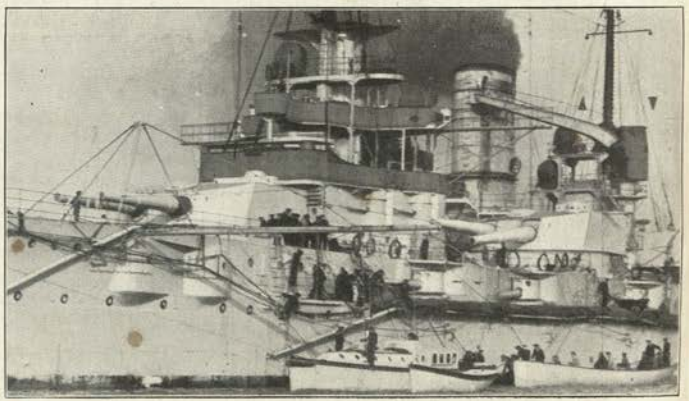
Broadside: 8—11 in., 6—6 in.

Machinery: 3 sets 3 cylinder triple expansion. 3 screws. Boilers: 12 Schulz Thornycroft. Designed H.P. 20,000 = 19·5 kts. Coal: *normal*, 950 tons; *maximum*, 2700 tons, also 200 tons oil.
Armour Notes.—Underwater lateral bulkheads, 2″ thick amidships.
Gunnery Notes.—All round loading positions to big guns, but fixed elevation. Electric, hydraulic and hand gear. Electric hoists to all guns. Ammunition supply to 6 inch reported unsatisfactory. Spotting stations aloft. Controls in each turret.
Torpedo Notes.—Net defence fitted to all. Specially large searchlights.
Engineering Notes.—Excellent steamers. *Nominal* radius 5700 miles at economical speed.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*Trials*	*Boilers*	*Best recent speed*
Westfalen	Weser, Bremen	Weser	July, '07	Oct., '09		27,104 = 20·3		20·4
Nassau	Wilhelmshaven		July, '06	Oct., '09		25,508 = 20	Schülz	20·8
Posen	Krupp	Krupp	July, '07	Mar., '10		27,745 = 20	in all	21·39
Rheinland	Vulkan, Stettin	Vulkan	Aug., '07	Mar., '10		26,100 = 20·3		20·3

General Notes.—Cost of *Nassaus* £1,838,000 per ship. Keel of *Nassau* laid 1906, but no further progress was made on her till July, 1907. As originally designed she was to have carried only eight big guns. These ships steam well, but they draw more than the designed draught by at least a foot. They are very cramped internally and it is difficult to accommodate the crews. They are only moderately successful, being overgunned for their displacement, but they are extremely steady gun platforms. The shooting from these ships always averages better than from any others.
All these ships carry a large supply of blockade mines. Frahm anti-rolling tanks in all.





1912 GERMAN BATTLE-CRUISERS (*Linienschiff Kreuzer*). Nos. **23, 24** (Dreadnoughts).

DERFFLINGER (June, 1913), **LÜTZOW** (Nov., 1913), *ERSATZ HERTHA* (1914).

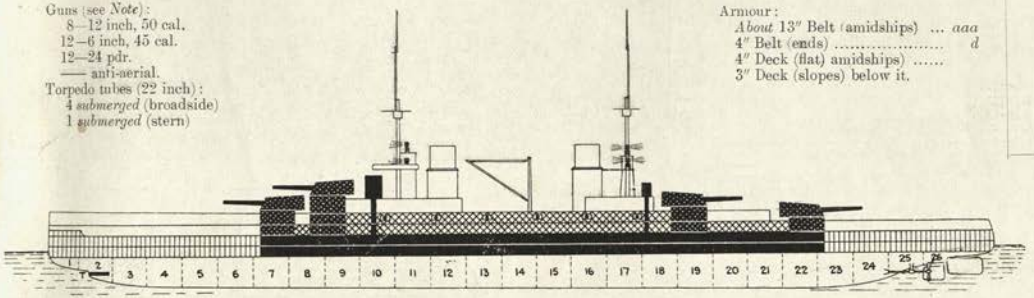
Displacement. 28,000 tons. Complement, .

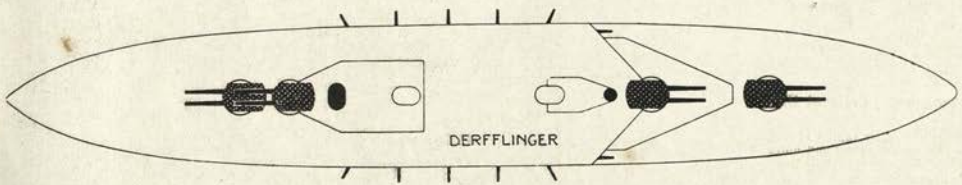
Length, feet. Beam, feet. Draught, feet.

Guns (see *Note*):
8—12 inch, 50 cal.
12—6 inch, 45 cal.
12—24 pdr.
—— anti-aerial.
Torpedo tubes (22 inch):
4 *submerged* (broadside)
1 *submerged* (stern)

Armour:
About 13″ Belt (amidships) ... *aaa*
4″ Belt (ends) ..... *d*
4″ Deck (flat) amidships) .....
3″ Deck (slopes) below it.

No photo procurable.





Armour Notes.—There is a flat 4″ upper protective deck amidships against aerial attack.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Best recent speed*
Derfflinger	Blohm & Voss	Blohm & Voss	Mar. '12	July '14			
Lützow	Schichau, Dan'g	Schichau	Sept. '12	'15			
E. Hertha	Wilhelmsh'n Y.	...	July '13	'16			

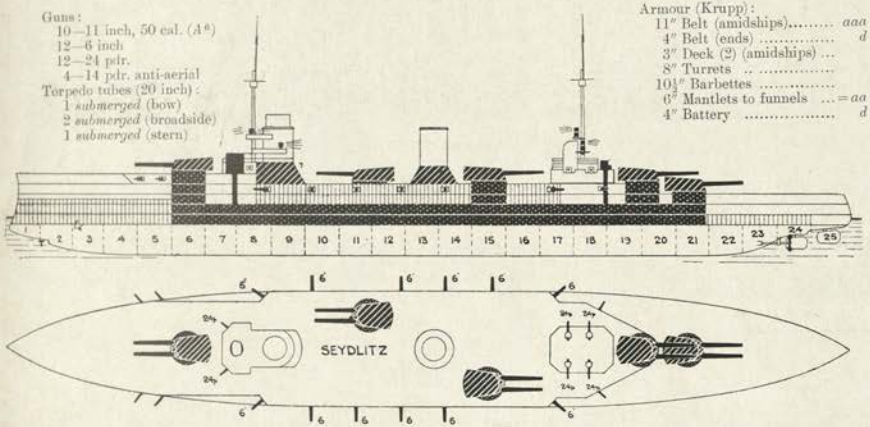
SEYDLITZ (April, 1912).

Displacement, 25,000 tons. Complement, .

Length (*over all*), 656 feet (*waterline* 648). Beam, 93½ feet. *Maximum* draught, 28 feet *or less* (*mean* 26½).

Guns:
10—11 inch, 50 cal. (A^6)
12—6 inch
12—24 pdr.
4—14 pdr. anti-aerial
Torpedo tubes (20 inch):
1 *submerged* (bow)
2 *submerged* (broadside)
1 *submerged* (stern)

Armour (Krupp):
11″ Belt (amidships)..... *aaa*
4″ Belt (ends) ..... *d*
3″ Deck (2) (amidships) ...
8″ Turrets .. ..
10½″ Barbettes .....
6″ Mantlets to funnels ... = *aa*
4″ Battery ..... *d*



Machinery: Parsons turbine (2 stage). 3 screws. Boilers: 27 Schulz-Thornycroft. Designed H.P. 63,000 = 26·5 kts.

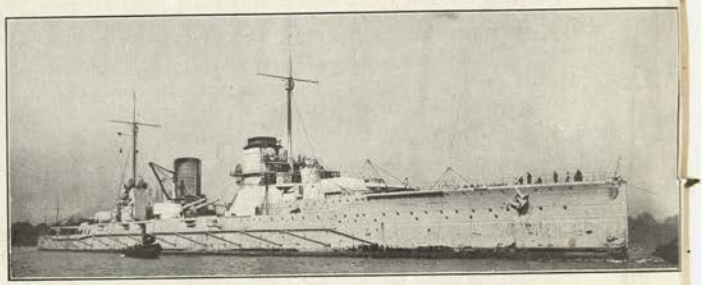
Armour Notes.—Generally as *Moltke*, but higher forward. The mantlet of fore funnel is 20 feet high, after funnel 12 feet. Main belt is about 400 feet long from turret to turret, of uniform thickness at waterline, reduced at upper and lower edges. Its height is about 15 feet. The double 3″ protective deck is amidships only; Upper flat, lower curved.

Gunnery Notes.—One of the turrets is electrically and hand manœuvred; all the others are hydraulic and hand.

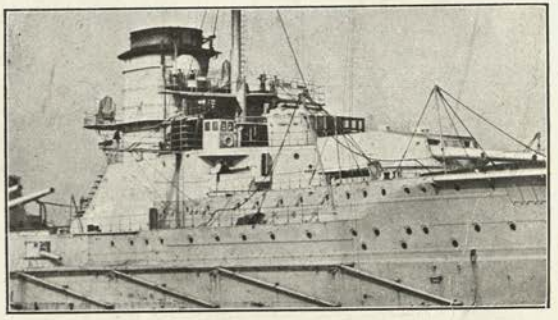
Torpedo Notes.—Net defence fitted. Also special internal protection more or less similar to that of the Argentine *Rividavia*.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Best recent speed*
Seydlitz	Blohm & Voss	Blohm & Voss	Feb.'11	May '13	—	Parsons	29

General Note.—*Seydlitz* 1910 programme. Immensely strong construction is the special feature of this type; they are specially designed to withstand attack by high explosives. Freeboard forward about 33 feet, aft 18 feet. Except for the high forecastle forward this ship closely resembles the *Moltke* class in appearance.



Note raised forecastle.

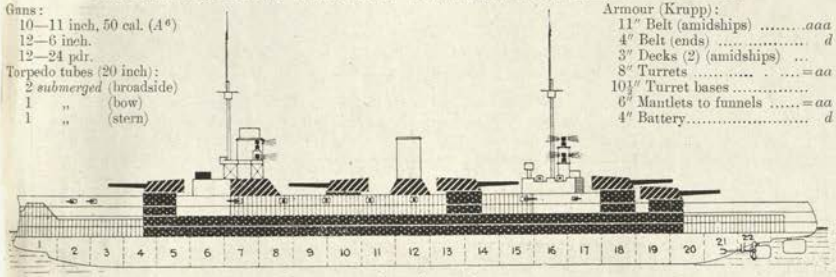


1909 GERMAN BATTLE-CRUISERS (*Linienschiff Kreuzer*). 9, 13 (Dreadnoughts).

MOLTKE (April, 1910) & **GOEBEN** (March, 1911).
Displacement, 23,000 tons. Complement, 1107.
Length (*waterline*), 590½ feet. Beam, 96¾ feet. *Max.* draught, 28 feet. Length *over all*, 610 feet.

Guns:
10—11 inch, 50 cal. (*A*[6])
12—6 inch.
12—24 pdr.
Torpedo tubes (20 inch):
2 *submerged* (broadside)
1 „ (bow)
1 „ (stern)

Armour (Krupp):
11″ Belt (amidships) ..... *aaa*
4″ Belt (ends) ..... *d*
3″ Decks (2) (amidships) ...
8″ Turrets ..... = *aa*
10½″ Turret bases .....
6″ Mantlets to funnels ..... = *aa*
4″ Battery ..... *d*



Ahead:
6—11
8—6

Astern:
8—11
2—6

Broadside: 10—11 in., 6—6 in.

Machinery: Parsons turbine. 4 screws. Boilers: 24 Schulz Thornycroft. Designed H.P. 70,000 = 27 kts. Coal: *normal* 1000 tons; *maximum* 3300 tons. Also oil, *about* 200 tons. Also 600 extra tons can be carried on deck.

Armour Notes.—The protection deck, the lower carved, the upper flat on top of main deck are amidships only. Protection decks at end are slight or non-existent. The funnel mantlets rise 12 feet above the upper deck, no special protection below upper deck. Belt about 390 feet long by 15 feet wide, uniform thickness at w.l.; tapering at upper and lower edges.

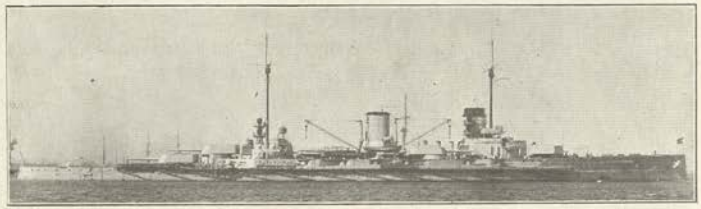
Gunnery Notes.—Hydraulic and hand gear to big guns; but superposed turret aft has special electrical gear which admits of one round every 7 or 8 seconds. Each turret stows 16 shell and charges for same in brass cases.

Torpedo Notes.—Net defence: 400 feet. 8—60″ searchlights in two groups of 4 each. No special control. 3 torpedoes per tube carried. 8 tubes have been reported, but this is doubtful.

Engineering Notes.—The nominal h.p. of these ships is 50,000 only, but this is obviously merely a fancy figure. The actual contract h.p. was 70,000. This was easily exceeded on trial with the *Moltke*, but her normal maximum speed is not much over 27 kts. a the outside, and 25 may be nearer actuality. 320 r.p.m. = *about* 27·75 kts. 428 = 29·5 kts. At full power consumption is 48 tons per hour, at 15 kts. it is 16 tons.

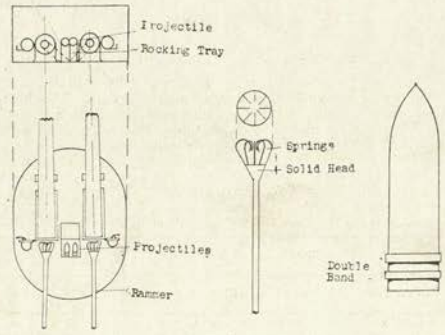
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials* 6 hrs. *mean.*	*runs.*	*Turbines*	*Best recent speed*
				To be				
Moltke	Blohm & Voss	Blohm & Voss	Apr.'09	Oct. '11	76,795 = 27·25	85,782 = 28·4	Parsons	28·4
Goeben	Blohm & Voss	Blohm & Voss	July,'09	Oct. '12	71,275 = 27·2	85·661 = 28	Parsons	28

General Notes.—*Moltke*, 1908 programme; *Goeben* belongs to the 1909 programme. Designed by Prof. Kretzschner. Meta centric height: 22¼ feet. Cost *about* £2,200,000 per ship. Fitted with Frahm anti-rolling tanks. All cupboards, shelves, etc, are of light sheet iron, the only wood being the tables and chairs. There are no pictures, arm chairs, settees or sofas in the wardroom. There are no ventilators on deck other than the erections around the fore funnel, and mainmast. Freeboard forward 26 feet, aft 18 feet. There are 2 steering engines in separate compartments in tandem. Officers' quarters, aft.



Extra Gunnery Notes.—Big guns controlled from two armoured towers amidships. Unprotected spotting position on each masthead connected by voice-pipe with the towers. Big guns hand loaded with wooden rammers which have spring coils on head to allow of uniformly seating projectiles. Large holes cut in the back of turret in rear of each gun to allow the rammers to come out. Turrets are very roomy: no partition between guns. Guns can be loaded at any arc, but at only one fixed elevation. Crew of each turret, including magazine parties, is 70 men. Training, electric and hand. Loading, hydraulic and hand. Projectiles have 2 copper bands at ends, one for seating, one for rotating. Come up between guns delivered on a rocking tray. Charges come up in brass cylinders, in two halves (each 140 lbs.) which are loaded into the guns separately. Breech opens by hand by means of a coarse threaded screw and small fly wheel. At drill using a single dummy charge, loading time has been timed 5 seconds. Each turret has a range finder and rate instrument, connected with a transmitting station below. The 6 inch guns have their own control towers. Crew of each 6 inch gun, six men.

Details of *Moltke*.



Fire controls of *Moltke* are not amidships as in *Goeben*; but 3 on top of each other at base of each mast.

1907 GERMAN BATTLE-CRUISER (*Linien-Kreuzer*). No. 5.

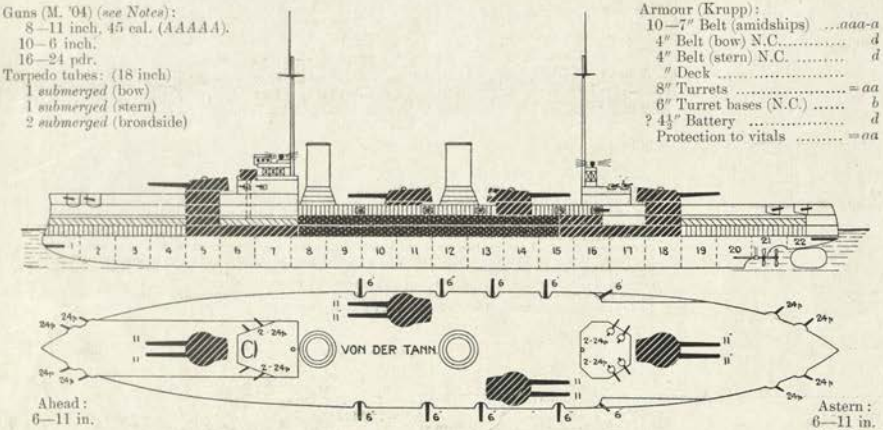
VON DER TANN (20th March, 1909).

Normal displacement, 19,400; *full load*, 21,000 tons. Complement, 910.

Length (*waterline*), 558 feet. Beam, 85 feet. *Max.* draught, 27½ feet. Length *over all*, 561 feet.

Guns (M. '04) (*see Notes*):
8—11 inch, 45 cal. (*AAAAA*).
10—6 inch.
16—24 pdr.
Torpedo tubes: (18 inch)
1 *submerged* (bow)
1 *submerged* (stern)
2 *submerged* (broadside)

Armour (Krupp):
10—7″ Belt (amidships) ...*aaa-a*
4″ Belt (bow) N.C. ..... *d*
4″ Belt (stern) N.C. ..... *d*
″ Deck .....
8″ Turrets ..... = *aa*
6″ Turret bases (N.C.) ..... *b*
? 4½″ Battery ..... *d*
Protection to vitals ..... = *aa*



Broadside: 8—11 in., 5—6 in.

Machinery: Turbine (Parsons). 4 screws. Boilers: 18 Schulz-Thornycroft. Designed H.P. 50,000 = 25 kts. Coal: *normal* 1000 tons; *maximum* 2800 tons. Also 300 tons oil.

Armour Notes.—Main belt is 14½ feet wide amidships. About 10 feet is above waterline and 4½ below l.w.l. There is a flat armour deck on top of this belt: usual sloping deck from bottom edge. The armour thicknesses given are approximately correct to about an inch. *Exact* thicknesses cannot be ascertained. Belt at ends is about 11½ feet wide, the upper strake being considerably thinner than the lower. Except amidships the belt does not rise to the main deck, though always so represented in plans of German origin.

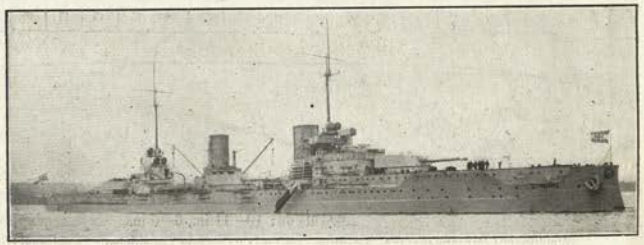
Gunnery Notes.—

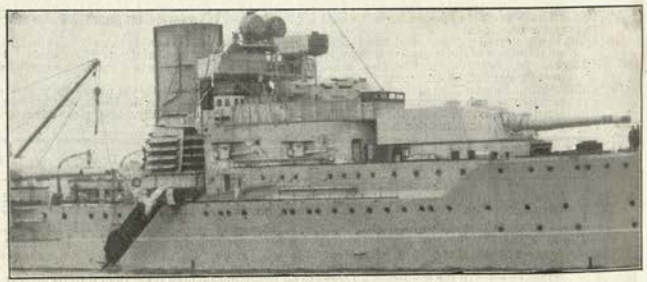
Torpedo Notes.—The stern submerged tube is on the starboard side of the stern post.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed.*
Von der Tann	Blohm & Voss	Blohm & Voss	Oct'08	Sept., '10	= 79,802 = 27·4	Schulz-T.	28·1

General Notes.—Cost, £1,833,000. Belongs to 1907 programme, but there was considerable delay in commencing her. The *Von der Tann* is an excellent steamer; but not a particularly good sea-boat. The guns are very well placed, and there is practically no interference at all. All the work in this ship is extremely good, and all details of her internal fittings are most carefully thought out. Frahm tanks. Designed by Prof. Kresschner.

Torpedo nets now fitted.





(DEUTSCHLAND CLASS—5 SHIPS).

DEUTSCHLAND (Nov., 1904), **HANNOVER** (Sept., 1905), **POMMERN** (Dec., 1905), **SCHLESWIG-HOLSTEIN** (Dec., 1906), and **SCHLESIEN** (May, 1906).

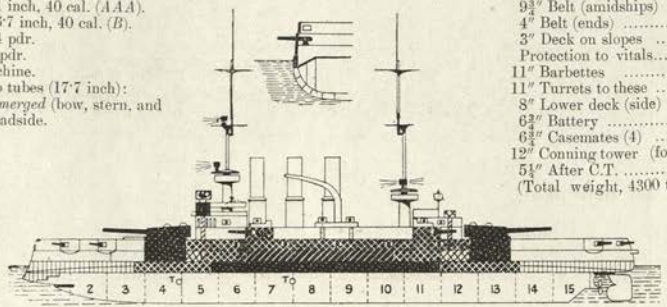
Displacement, 13,200 tons. Complement, 729.

Length (*waterline*), 410 feet. Beam, 72 feet. *Mean* draught, 25 feet. Length *over all*, 430 feet.

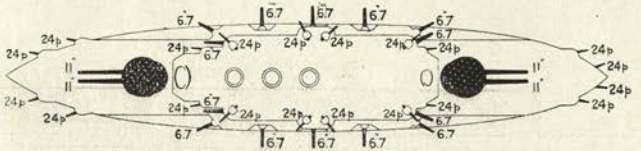
Guns (M. '01):
4—11 inch, 40 cal. (*AAA*).
14—6·7 inch, 40 cal. (*B*).
20—24 pdr.
4—1 pdr.
4 Machine.

Torpedo tubes (17·7 inch):
6 *submerged* (bow, stern, and broadside.

Armour (Krupp) *see Notes*:
9¾″ Belt (amidships) ... *aaa*
4″ Belt (ends) ..... *d*
3″ Deck on slopes .....
Protection to vitals... = *aaaa*
11″ Barbettes ..... *aaa*
11″ Turrets to these ..... *aaa*
8″ Lower deck (side) ... *aa*
6¾″ Battery ..... *a*
6¾″ Casemates (4) ..... *a*
12″ Conning tower (fore) *aaa*
5¼″ After C.T. ..... *b*
(Total weight, 4300 tons.)



Ahead:
2—11 in.
4—6·7 in.



Astern:
2—11 in.
4—6·7 in.

Broadside: 4—11 in., 7—6·7 in.

Machinery: 3 sets 3 cylinder vertical triple expansion. 3 screws. Boilers: 12 Schulz Thornycroft. Designed H.P. 16,000 = 18 kts. Coal: *normal* 800 tons; *maximum* 1800 tons. Also 200 tons liquid fuel (in double bottom). *Nominal* radius 5500 kts. at 10 kts.

Armour Notes.—*Deutschland's* belt is only 9 inch, and battery is ½ inch thicker than in the other 4.

Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric, all guns. Big guns manœuvred by electric and hand gear; secondary guns, electric and hand gear.

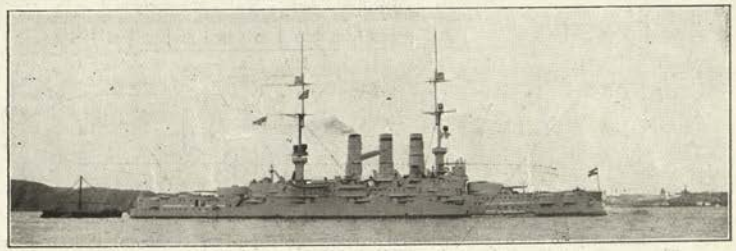
Arcs of fire: Big guns, 270°; casemates and end battery guns 135° from axial line; other battery guns, 110°.

Engineering Notes.—Coal consumption: *normal* 8½ tons an hour at 17 kts.; about 13 tons at 18 kts. Can steam about 3500 miles at 17 kts. and 2500 at full speed.

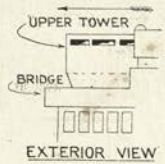
Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed*	*Trials: 22 hrs. at ¾.*	*6 hrs. full p.*	*Boilers.*	*Best recent speed.*
Deutschland	Krupp	Krupp	1903	1906	11,377 = 17·1	16,935 = 15·53	Schulz in all.	18·9
Hannover	Wilhelmsh'vn	...	1904	1907	12,153 = 16·9	17,768 = 18·7		19·16
Pommern	Vulkan Co.	Vulkan	1904	1907		17,696 = 18·5		19·21
Schleswig-Holstein	Schichau	Schichau	1905	1908		19,868 = 19		
Schlesien	Krupp	Krupp	1905	1908		19,465 = 18·5		19·03

General Notes.—Cost per ship complete about £1,200,000. These ships of the *Deutschland* class are over-gunned. The secondary guns fire too heavy a projectile for man-handling, and the actual value of the class is well below their paper value. They are very good steamers; but otherwise hardly equal to British, U.S.A., and French ships of equal date.

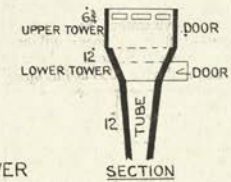
Note.—In *Deutschland* and *Hannover* the searchlight forward instead of being carried on the fighting top is on a platform just above it.



POMMERN.



CONNING TOWER



1901 GERMAN BATTLESHIPS (18 knot).

(Braunschweig Class—5 Ships.)

BRAUNSCHWEIG (Dec., 1902), **ELSASS** (May, 1903), **LOTHRINGEN** (May, 1904), **HESSEN** (Aug., 1903), & **PREUSSEN** (Oct., 1903).

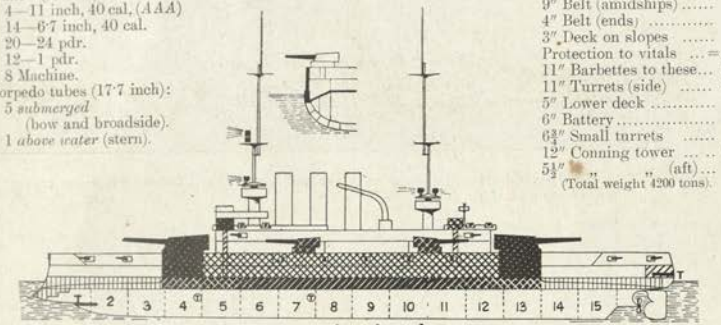
Displacement, 13,200 tons. Complement, 691.

Length (*waterline*), 410 feet. Beam, 72 feet. *Mean* draught, 25¾ feet. Length *over all*, 430 feet.

Guns—(M. '01.) renewed 1912:
4—11 inch, 40 cal, (*AAA*)
14—6·7 inch, 40 cal.
20—24 pdr.
12—1 pdr.
8 Machine.

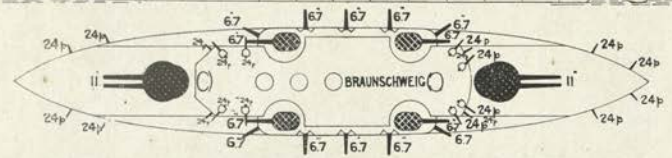
Torpedo tubes (17·7 inch):
5 *submerged*
(bow and broadside).
1 *above water* (stern).

Armour (Krupp):
9″ Belt (amidships) ..... *aa*
4″ Belt (ends) ..... *d*
3″ Deck on slopes ..... *a*
Protection to vitals ...= *aaa*
11″ Barbettes to these... *aaa*
11″ Turrets (side) ..... *aaa*
5″ Lower deck ..... *b*
6″ Battery ..... *b*
6¾″ Small turrets ..... *a*
12″ Conning tower ... .. *aaa*
5½″ „ „ (aft)... *b*
(Total weight 4200 tons).



Ahead
2—11
4—6·7

Astern
2—11
4—6·7



Broadside: 4—11 in., 7—6·7 in.

Machinery: 3 sets 3 cylinder vertical inverted triple expansion. 3 screws. Boilers: 8 Schulz-Thornycroft + 6 cylindrical. Designed H.P. 16,000 = 18 kts. Coal: *normal* 700 tons; *maximum* 1600 tons. Also 200 tons of oil (in double bottom). *Nominal* radius: 5500 miles at 10 kts.

Armour Notes—Belt is 7 feet wide, 4½ feet of it below waterline; lower edge is about 7″ thick amidships.

Gunnery Notes—Loading positions, big guns all round. Hoists, electric for all guns. Big guns manœuvred, electric, hydraulic, and hand gear; secondary guns, electric and hand gear.

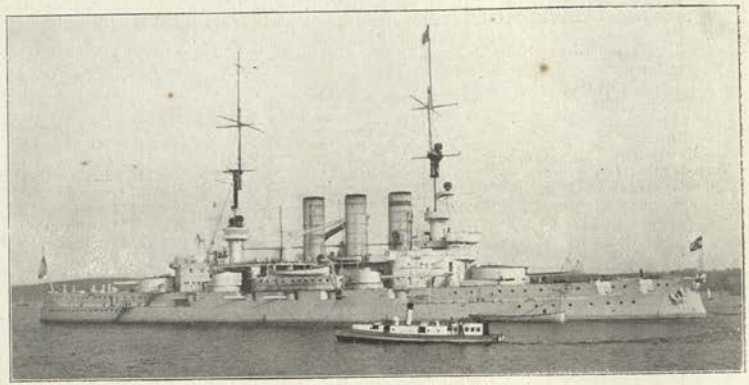
Arcs of fire: Big guns 250°; small turrets 150° from axial line; end battery guns 135°; other battery guns 110°.

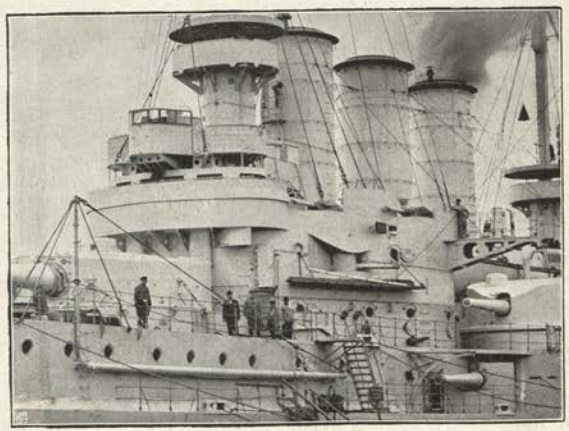
Height of guns above water: Big turrets about 23 feet.

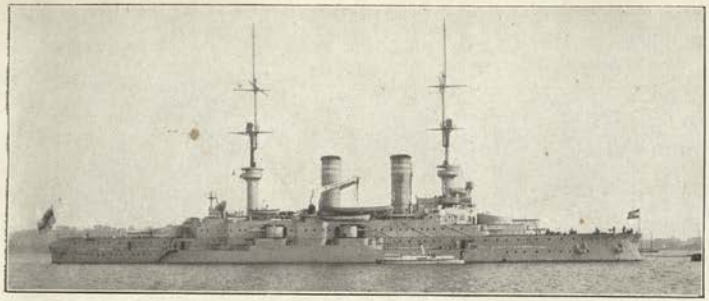
Engineering Notes—116 revolutions = full speed; 97 = 16·4 kts.; 67 = 12 kts.; 45 = 8·2 kts. *about*. Consumption (*normal*): 9¼ tons an hour at 16½ kts.; 14-15 tons at 18 kts. Can do about 3000 miles at 17 kts. and over 2000 at full speed.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Full power trials.* 24 *hrs.*	6 *hrs.*	*Boilers.*	*Best recent speed.*
Braunschweig	Krupp		1901	1904	11,382 = 16·3	17,312 = 18·6		18·1
Hessen	Krupp		1902	1905	11,384 = 16·4	16,900 = 18·23	8 Schulz-T.	
Preussen	Vulkan Co.	By	1902	1905	11,304 = 16·2	18,374 = 18·69	and 6 cyl.	
Elsass	Schichau	Builders	1901	1904	11,554 = 16·7	16,812 = 18·7	in all.	18·6
Lothringen	Schichau		1902	1906	11,573 = 16·5	16,950 = 18·54		

General Notes—Average cost *complete*, £1,160,000. Notes to *Deutschlands* apply to these ships also.





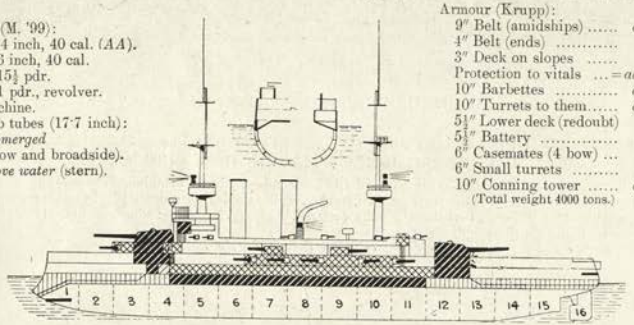


WITTELSBACH (1900), **WETTIN** (1901), **ZÄHRINGEN** (1901), **MECKLENBURG** (1901), **SCHWABEN** (1901).

Displacement, 11,830 tons. Complement, 650 (as flag-ship, 715).
Length (*waterline*) 400 feet. Beam 67 feet. *Maximum* draught, 28 feet. Length *over all*, 416½ feet.

Guns—(M. '99):
4—9·4 inch, 40 cal. (*AA*).
18—6 inch, 40 cal.
12—15½ pdr.
12—1 pdr., revolver.
8 Machine.
Torpedo tubes (17·7 inch):
5 *submerged*
(bow and broadside).
1 *above water* (stern).

Armour (Krupp):
9″ Belt (amidships) ..... *aa*
4″ Belt (ends) ..... *d*
3″ Deck on slopes .....
Protection to vitals ...=*aaa*
10″ Barbettes ..... *aa*
10″ Turrets to them..... *aa*
5½″ Lower deck (redoubt) *b*
5½″ Battery ..... *b*
6″ Casemates (4 bow) ... *b*
6″ Small turrets ..... *b*
10″ Conning tower ..... *aa*
(Total weight 4000 tons.)

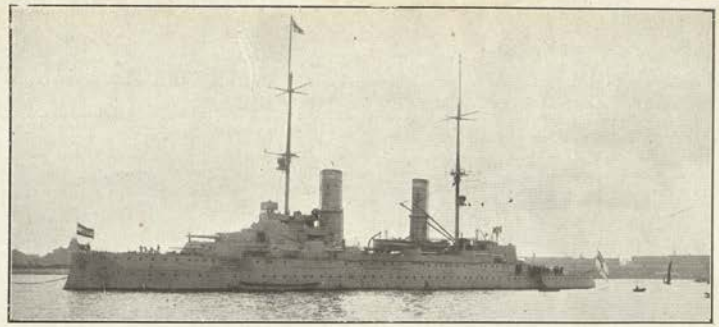


Ahead:
2—9·4 in.
8—6 in.

Astern:
2—9·4 in.
6—6 in.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: 6 Schulz Thornycroft and 6 cylindrical. Designed H.P. 15,000=18 kts. Coal: *normal* 653 tons; *maximum* 1,400 tons. Oil: 200 tons.

Name.	*Builder.*	*Machinery.*	*Laid down*	*Completed.*	*Refit*	*At 10,000 H.P. (95 revs.)*	*Full power (104 revs.)*	*Boilers.*	*Best recent speed.*
Wittelsbach	Wilhelmsh'vn		1898	1902		10,000=16	14,483=18		17·6
Wettin	Schichau	Schichau	1899	1902		10,300=16·3	14,500=18	6 Schulz-T. and cyl. in all.	18·1
Zähringen	Germania	Krupp	1899	1902		=	=19		
Mecklenburg	Vulkan Co.	Vulkan	1900	1903		=	=18·1		
Schwaben	Wilhelmsh'vn		1900	1903		=	=18		

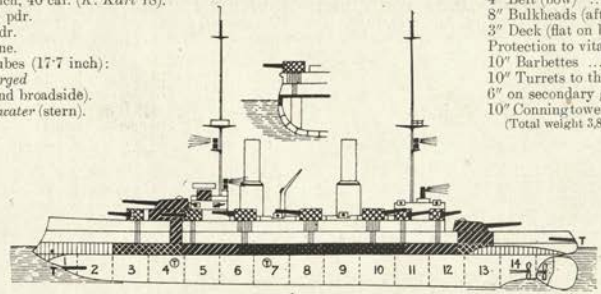


KAISER FRIEDRICH III. (1896), **K. WILHELM II.** (1897), **K. BARBAROSSA** (1900), **K. WILHELM DER GROSSE** (1899), **K. KARL DER GROSSE** (1899),

Displacement, (reconstructed) 10,790 tons. Complement, 658.
Length (*waterline*), 384 feet. Beam, 65½ feet. *Maximum* draught, 27 feet.

Guns—(M. '95):
4—9·4 inch, 40 cal. (*A*).
14—6 inch, 40 cal. (*K. Karl* 18).
12—15½ pdr.
12—1 pdr.
8 Machine.
Torpedo tubes (17·7 inch):
5 *submerged*
(bow and broadside).
1 *above water* (stern).

Armour (Krupp):
12″ Belt (amidships) ... *aaa*
4″ Belt (bow) ..... *d*
8″ Bulkheads (aft) ..... *aa*
3″ Deck (flat on belt) ...
Protection to vitals is... *aaa*
10″ Barbettes ..... *aa*
10″ Turrets to these ... *aa*
6″ on secondary guns... *b*
10″ Conning tower (N.C.) *aa*
(Total weight 3,800 tons).

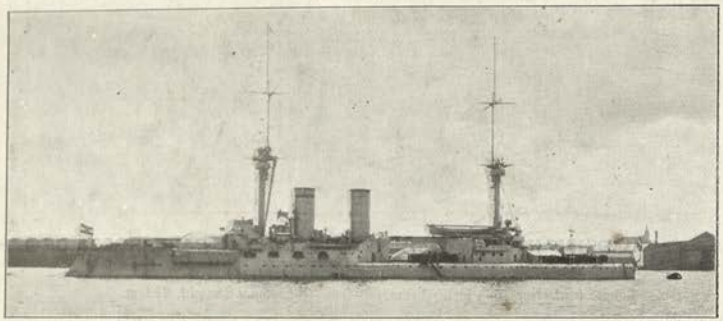


Ahead:
2—9·4 in.
6—6 in.

Astern:
2—9·4 in.
6—6 in.

Machinery: 3 sets vertical 3 cylinder triple expansion. 3 screws. Boilers: 8 cylindrical, 4 Schultz; (in *K. Karl der Grosse* and *K. Barbarossa* 6). Designed H.P. 14,000=18 knots. Coal: *normal* 650 tons; *maximum* 1,050 tons; also 200 tons liquid fuel (double bottom).

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*		*Boilers*	*Best recent speed*
K. Friedrich III.	Wilhelmsh'vn	...	1895	1898	1908				
K. Wilhelm II.	Wilhelmsh'vn	...	1896	1900	1908				
K. W. der Grosse	Krupp	Krupp	1898	1901	1908				
K. Karl der Grosse	Blohm & Voss	Blohm & Voss	1898	1901					
K. Barbarossa	Schichau	Schichau	1898	1901	1907	7360=15·5	13,940=18		17·5



BRANDENBURG (1891) & **WÖRTH** (1892).

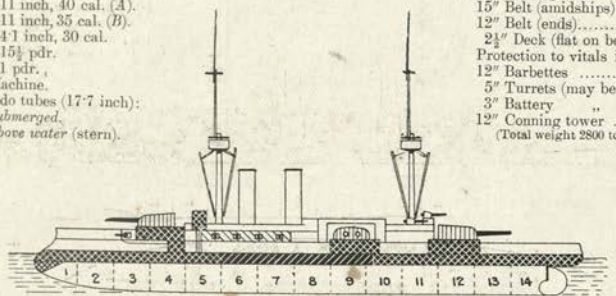
Displacement, 10,060 tons. Complement, 568.

Length (*waterline*), 354½ feet. Beam, 64 feet. *Maximum* draught, 26 feet. Length *over all*, 380½ feet.

Guns—(old models):
4—11 inch, 40 cal. (*A*).
2—11 inch, 35 cal. (*B*).
8—4·1 inch, 30 cal.
8—1½ pdr.
12—1 pdr.,
4 Machine.

Torpedo tubes (17·7 inch):
2 *submerged*.
1 *above water* (stern).

Armour (compound):
15″ Belt (amidships) ... *aa*
12″ Belt (ends)..... *a*
2½″ Deck (flat on belt)
Protection to vitals is... *aa*
12″ Barbettes ..... ,, *a*
5″ Turrets (may be less) *d*
3″ Battery ,, *e*
12″ Conning tower ..... *a*
(Total weight 2800 tons).



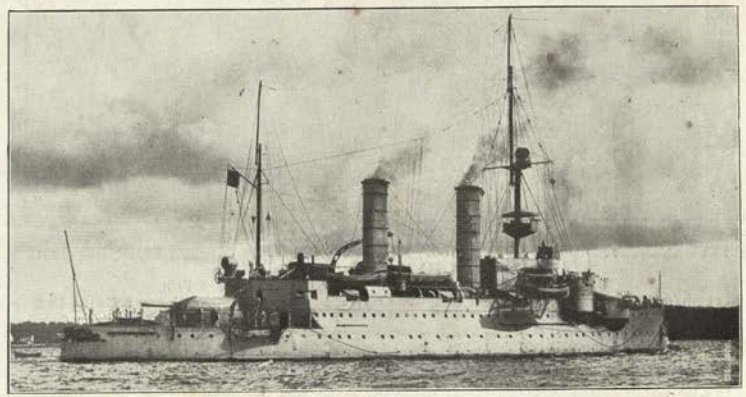
Ahead: 2—11in.

Astern: 2—11 in.

Broadside: 4—11 in., 2—11 in., 4—4·1 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: 12 cylindrical, return flame. Designed H.P. *forced* 10,000=17 kts. Coal: *normal* 600 tons; *maximum* 1050 tons.

Gunnery Notes.—Loading positions, big guns: end on. Big guns manœuvred: hydraulic and hand gear. Continuous firing slow, but they have special arrangements for firing a few rounds quickly.



ODIN (1894) & **ÆGIR** (1895), 4150 tons.

and

SIEGFRIED (1889), **BEOWULF** (1890), **FRITHJOF** (1891), **HEIMDALL** (1892), **HILDEBRAND** (1892), **HAGEN** (1893). 4100 tons.

Guns (in all): 3—old 9·4 inch, 35 cal. (*C*); 10—1½ pdr.; 6—1 pdr.; 4 machine. Torpedo tubes: 3—17·7 inch, *submerged*. Armour: In first two, nickel, belt (amidships only) 8½″; in others, compound, complete belt 9½″—6″, barbettes (2 guns forward, 1 aft) 8″. Speeds: about 15 kts. (Fuller details see 1910 and previous editions.

(Employed on coast defence in the Baltic.)

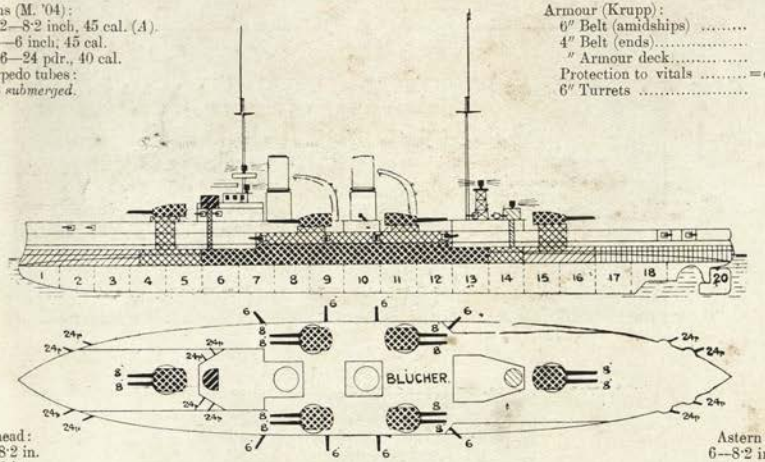
BLUECHER (April, 1908).

Normal displacement, 15,500 tons. Complement, 847.

Length (*waterline*), 489 feet. Beam, 80½ feet. *Maximum* draught, 27 feet. Length *over all*, 493 feet.

Guns (M. '04):
12—8·2 inch, 45 cal. (*A*).
8—6 inch; 45 cal.
16—24 pdr., 40 cal.
Torpedo tubes:
3 *submerged*.

Armour (Krupp):
6″ Belt (amidships) ..... *a*
4″ Belt (ends)..... *d*
″ Armour deck..... .....
Protection to vitals .....=*aa*
6″ Turrets ..... *b*



Ahead:
6—8·2 in.
2—6 in.

Astern:
6—8·2 in.
2—6 in.

Broadside: 8—8·2 in., 4—6 in.

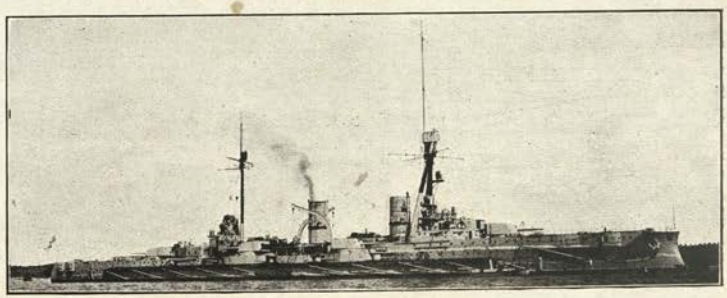
Machinery: 3 sets vertical inverted triple expansion. 3 screws. Boilers: 18 Schulz-Thornycroft. Designed H.P. 32,000=24·5 kts. Coal: *normal* 900 tons; *maximum* 2300; and 200 tons oil.

Gunnery Notes.—Most of big guns replaced, 1912. Fire control in each turret. Masthead spotting stations.

Torpedo Notes.—Nets fitted, 1911.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials.*	*Boilers*	*Best recent speed.*
Blucher	Kiel Yard		Oct'06	Sep'09	*mean.* 43,886=25·86	Schulz Thornycroft	26·4

General Notes.—Total cost, £1,349,000. On her trials this ship touched 26·4 kts. She is a very successful ship in all respects.



BLUECHER, 1914, new rig.

1904 GERMAN ARMOURED CRUISERS (*Panzer-Kreuzer*) (22½ knot).

(Scharnhorst Class—2 Ships).

SCHARNHORST (March, 1906) & **GNEISENAU** (June, 1906).

Displacement, 11,600 tons. Complement, 765.

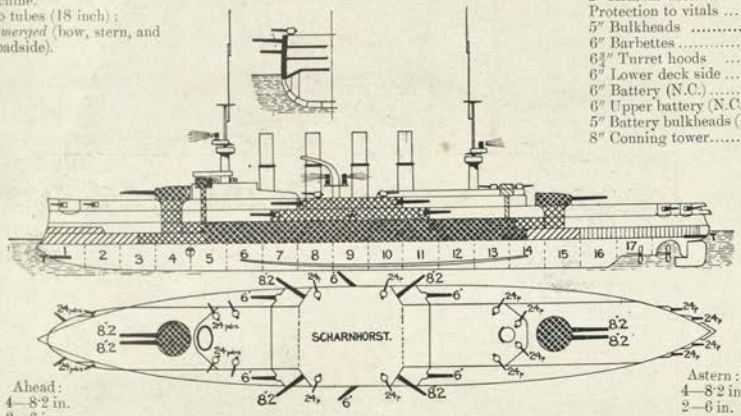
Length (*waterline*), 449¾ feet. Beam, 71 feet. *Mean* draught, 25 feet. Length *over all*, feet

Guns:
8—8·2 inch, 40 cal. (*A*).
6—6 inch, 40 cal.
20—24 pdr., 35 cals.
4 Machine.

Torpedo tubes (18 inch):
4 *submerged* (bow, stern, and broadside).

Armour (Krupp):

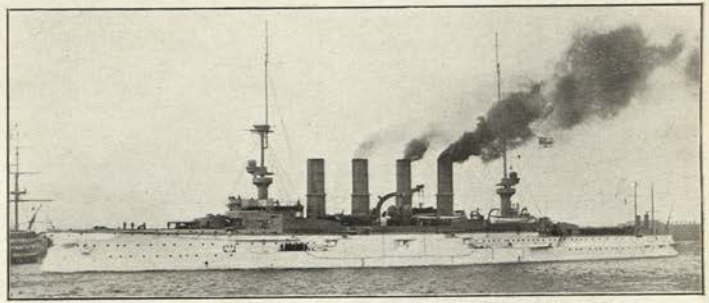
6″ Belt (amidships)	*a*
4¾″ Belt (bow)	*c*
4″ Belt (aft)	*d*
2″ Armour deck	
Protection to vitals	*aa*
5″ Bulkheads	*b*
6″ Barbettes	*b*
6¾″ Turret hoods	*a*
6″ Lower deck side	*a*
6″ Battery (N.C.)	*b*
6″ Upper battery (N.C.)	*b*
5″ Battery bulkheads (K.C.)	*b*
8″ Conning tower	*a*

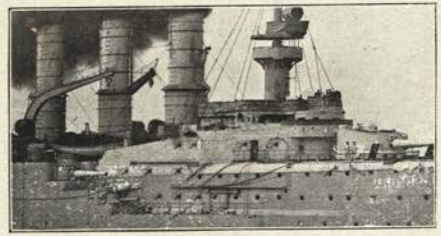


Ahead:
4—8·2 in.
2—6 in.

Astern:
4—8·2 in.
2—6 in.

Broadside: 6—8·2 in., 3—6 in.





Machinery: 2 sets vertical inverted triple expansion. 3 cylinder; one set, central, 4 cylinder. 3 screws. Boilers: 18 Schulz Thornycroft. Designed H.P. 26,000 = 22·5 kts. Coal: *normal* 800 tons; *maximum* 2000 tons (also 200 tons oil).

Armour Notes.—

Gunnery Notes.—Hoists, electric and hand (one serving two or three guns). Masthead fire controls fitted 1912.

Torpedo Notes.—6 searchlights. Electrical installation at 115 volts. Two turbo generators each 4000 r.p.m.—load, 850 amperes.

Engineering Notes.—Full speed 120 revs. 95 = 20·5 kts. *about*. The three engine rooms separated by solid bulkheads. Boiler rooms ditto.

Name.	*Builders.*	*Machinery.*	*Laid down.*	*Completed.*	*Refit.*	*Trials, full power.*		*Boilers.*	*Best recent speed.*
Gneisenau	Weser, Bremen.		1904	1907			=24·8	S. Th'nyc'ft.	24·8
Scharnhorst	Blohm & Voss, Hamburg		1905	1907		18,052 = 20·7	27,759 = 22·7	S. Th'nyc'ft.	21

General Notes.—*Scharnhorst* grounded badly in 1909 and since then has never been able to steam as well as before. These carry two 200 h.p. 48 feet motor launches (16 kts.), 1—8 kt. motor barge, 2 steam boats.

1902 GERMAN ARMOURED CRUISERS (21 knots)

(Roon Class.—2 Ships).

ROON (June, 1903) & **YORCK** (May, 1904).

Displacement, 9050 tons. Complement, 557.

Length (*waterline*), 403¼ feet. Beam, 65½ feet. *Maximum* draught, 25¾ feet.

Guns:
- 4—8·2 inch, 40 cal. (*A*).
- 10—6 inch, 40 cal.
- 14—24 pdr.
- 4 Machine.

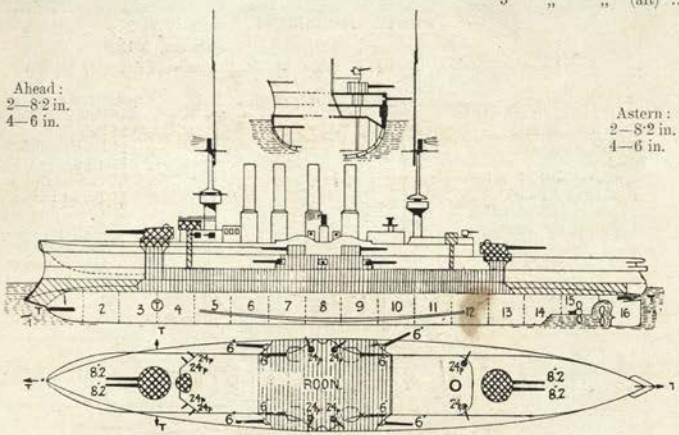
Torpedo tubes (18 inch):
- 4 *submerged* (bow, stern, and broadside).

Armour (Krupp):

4″ Belt (amidships)	
3″ Belt (ends)	*e*
2¾″ Deck (slopes)	
Protection to vitals	= *c*
6″ Turrets	*b*
4″ Turret bases	*d*
4″ Lower deck redoubt	*d*
4″ Battery	*d*
4″ Small turrets	*d*
6″ Conning tower (fore)	*b*
3″ „ „ (aft)	*e*

Ahead:
2—8·2 in.
4—6 in.

Astern:
2—8·2 in.
4—6 in.

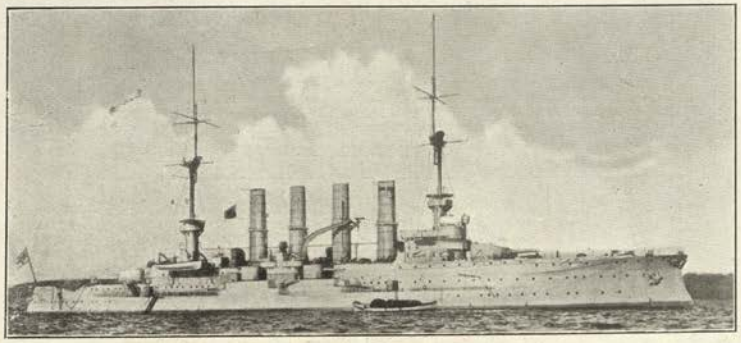


Broadside: 4—8·2 in., 5—6 in.

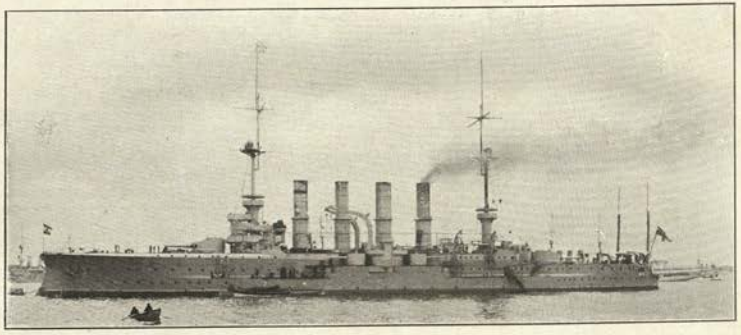
Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: 16 Dürr. Designed H.P. 19,000 = 21 kts. Coal: *normal* 750 tons; *maximum* 1600 tons; also 200 tons of oil. 118 revs. = full speed.

General Notes.—Except for some minor details and slightly increased H.P., these ships are identical with the *P. Adalbert* class (*q.v.*)

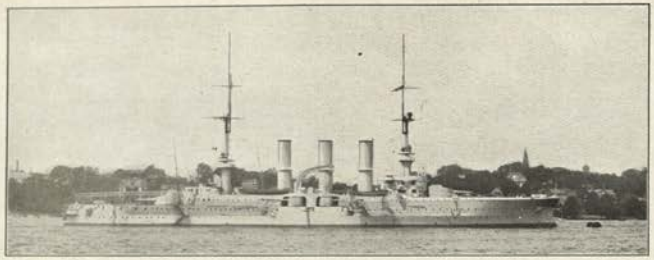
Name.	*Built at*	*Laid down.*	*Completed.*	*Trials.* 24 *hours.*		*Boilers.*
Yorck	Blohm & Voss	April, '03	May, '06	13,711 = 19 kts.	20,295 = 21·4 kts.	Dürr
Roon	Kiel Dockyard	Aug., '02	Oct., '05		20,625 = 21·17 kts.	Dürr



Roon (solid cranes).



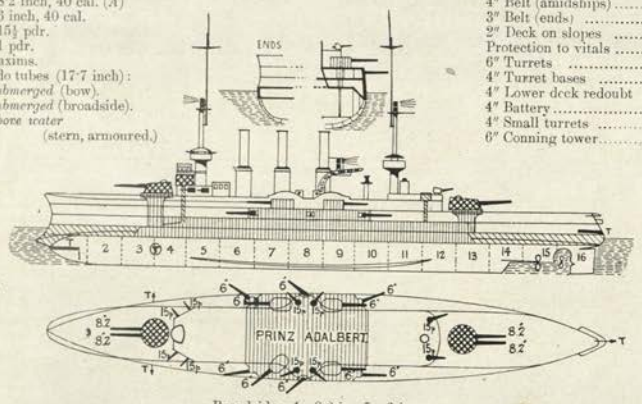
Yorck (pierced cranes).



PRINZ ADALBERT (June, 1901) & **FRIEDRICH KARL** (June, 1902).
Displacement, 9050 tons. Complement, 557.
Length (*waterline*), 394 feet. Beam, 65 feet. *Maximum* draught, 25¾ feet.

Guns:
4—8·2 inch, 40 cal. (*A*)
10—6 inch, 40 cal.
10—15½ pdr.
10—1 pdr.
4 Maxims.
Torpedo tubes (17·7 inch):
1 *submerged* (bow).
2 *submerged* (broadside).
1 *above water* (stern, armoured.)

Armour (Krupp):
4″ Belt (amidships) ..... *d*
3″ Belt (ends) ..... *e*
2″ Deck on slopes .....
Protection to vitals ..... = *c*
6″ Turrets ..... *b*
4″ Turret bases ..... *d*
4″ Lower deck redoubt ... *d*
4″ Battery ..... *d*
4″ Small turrets ..... *d*
6″ Conning tower ..... *b*

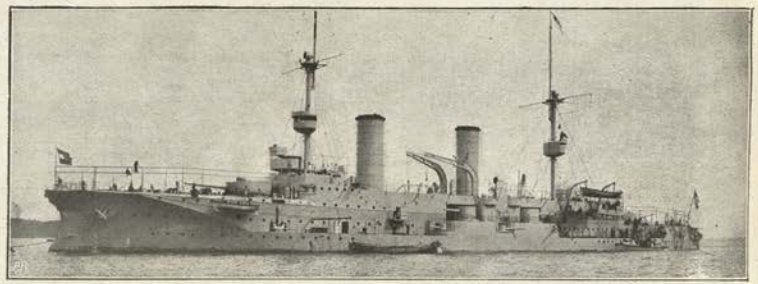


Ahead: 2—8·2 in. 4—6 in.
Astern: 2—8·2 in. 4—6 in.

Broadside: 4—8·2 in., 5—6 in.

Machinery: 3 sets 4 cylinder vertical inverted triple expansion. 3 screws. Boilers: *P. A.*, 14 Dürr; *F. K.* (1908) Schulz-Thornycroft. Designed H.P. 18500 = 21 kts. Coal: *normal* 750 tons; *max.* 1500 tons. Oil: 200 tons.

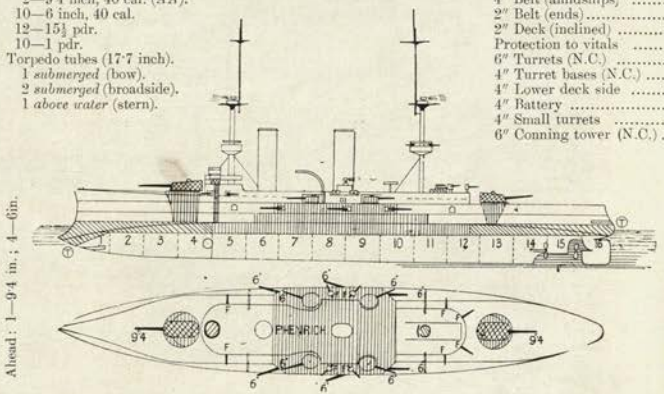
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*	*Boilers*	*Best recent speed*
P. Adalbert	Kiel Y.		Apl., '00	Oct., '03		17,600 = 20·3	Dürr	21
F. Karl	Blohm & Voss		Aug., '01	Oct., '03	1908	17,700 = 20·5		...



PRINZ HEINRICH (March, 1900).
Displacement, 8930 tons. Complement, 501.
Length (*waterline*), 394 feet. Beam, 65 feet. *Maximum* draught, 25½ feet.

Guns—(M. '99):
2—9·4 inch, 40 cal. (*AA*).
10—6 inch, 40 cal.
12—15½ pdr.
10—1 pdr.
Torpedo tubes (17·7 inch).
1 *submerged* (bow).
2 *submerged* (broadside).
1 *above water* (stern).

Armour (Krupp):
4″ Belt (amidships) .....*d*
2″ Belt (ends) .....*e*
2″ Deck (inclined) .....
Protection to vitals .....*c*
6″ Turrets (N.C.) .....*b*
4″ Turret bases (N.C.) .....*d*
4″ Lower deck side .....*d*
4″ Battery .....*d*
4″ Small turrets .....*d*
6″ Conning tower (N.C.) ...*b*

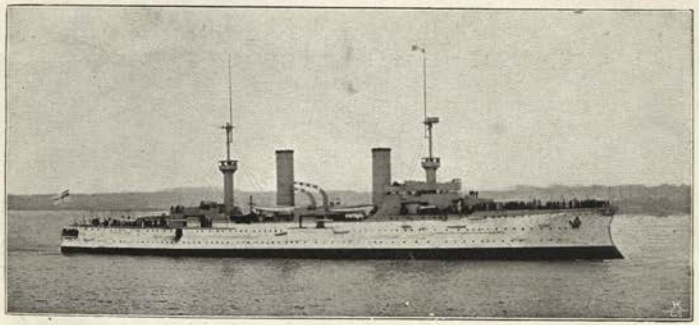


Ahead: 1—9·4 in.; 4—6in.
Astern: 1—9·4 in.; 4—6in.

Broadside: 2—9·4 in.; 5—6 in.

Machinery: 3 sets triple expansion four cylinder. 3 screws. Boilers: 14 Dürr. Designed H.P. 15,700 = 20 kts. Coal: *normal* 750 tons; *maximum* 1,500 tons. Also 200 tons liquid fuel.

1896 GERMAN ARMOURED CRUISER.



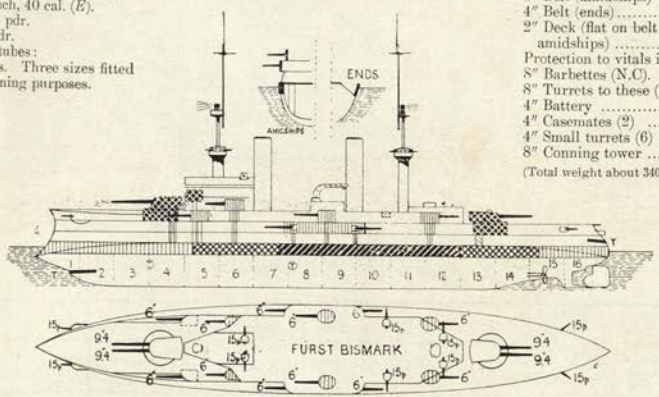
(*Seagoing torpedo school ship*) **FÜRST BISMARCK** (1897). (*Reconstructing.*)

Displacement, 10,700 tons (Sheathed). Complement, 529.

Length (*waterline*), 399 feet. Beam, 65½ feet. *Maximum* draught, 27 feet. Length *over all*, 410 feet.

Guns (M. 99): (some removed)
4—9·4 inch, 40 cal. (*AA*).
12—6 inch, 40 cal. (*E*).
10—15½ pdr.
14—1 pdr.
Torpedo tubes:
Various. Three sizes fitted for training purposes.

Armour (Krupp):
8″ Belt (amidships) ..... *aa*
4″ Belt (ends)..... *d*
2″ Deck (flat on belt amidships) ..... *aa*
Protection to vitals is ... *aa*
8″ Barbettes (N,C). ..... *a*
8″ Turrets to these (N.C.) *a*
4″ Battery ..... *d*
4″ Casemates (2) ..... *d*
4″ Small turrets (6) ..... *d*
8″ Conning tower ..... *a*
(Total weight about 3400 tons).

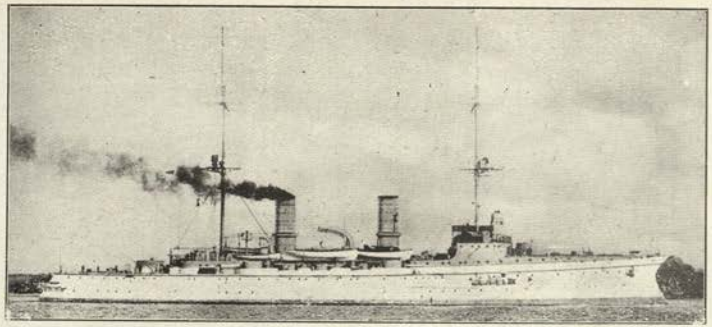


Ahead:
2—9·4 in.
6—6 in.

Astern:
2—9·4 in.
6—6 in.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: 8 Schulz Thornycroft and 8 cylindrical. Designed H.P. 13,600=19 kts. Coal: *normal* 1000 tons; *maximum* 1200 tons.

GERMAN BIG PROTECTED CRUISERS. **1895**

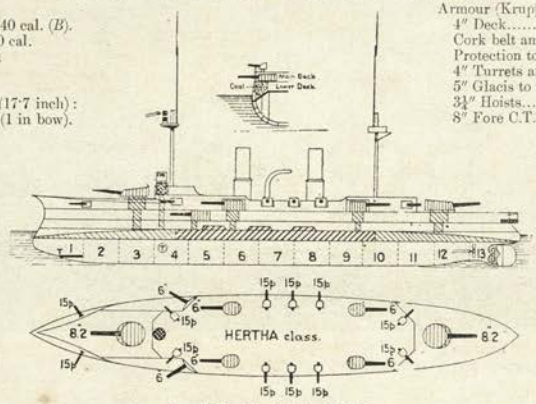


(*Training service*) **FREYA** (1897), **HERTHA** (1897), **VICTORIA LUISE** (1897), **HANSA** (1898), and **VINETA** (1897).

Displacement, 5660, but last two 5885 tons. Complement, 465.
Length, 344½ feet. Beam, 57 feet. *Maximum* draught, 23 feet.

Guns:
2—8·2 inch, 40 cal. (*B*).
6—6 inch, 40 cal.
12—15½ pdr.
10—1 pdr.
4 Machine.
Torpedo tubes (17·7 inch):
3 *submerged* (1 in bow).

Armour (Krupp):
4″ Deck.....= *c*
Cork belt amidships .....
Protection to vitals.....= *c*
4″ Turrets and casemates *d*
5″ Glacis to funnels.....
3½″ Hoists.....
8″ Fore C.T.....*ba*



Ahead:
1—8·2 in.
4—6 in.

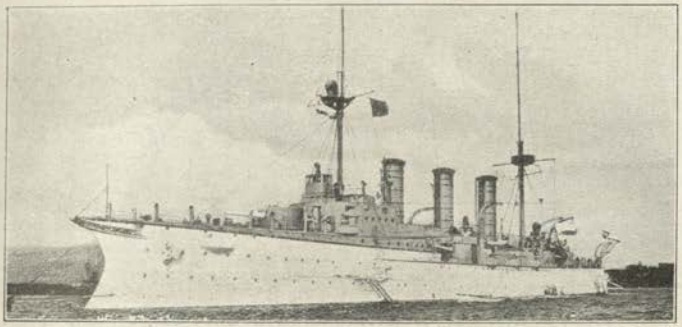
Astern:
1—8·2 in.
2—6 in.

Broadside: 2—8·2 in., 3—6 in.

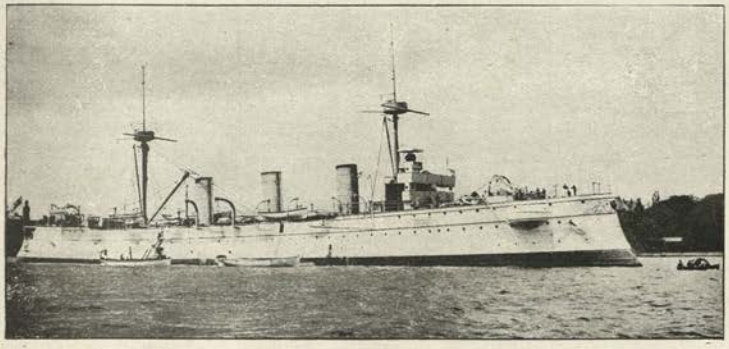
Machinery: 3 sets 4 cylinder triple expansion. 3 screws. Designed H.P. 10,500=19 kts. Coal: *normal* 900 tons; *maximum* 1,000 tons.

Name.	*Builder*	*Machinery*	*Laid down*	*Completed*	*Reconstructed*		*Boilers*	*Best recent speed*
Freya	Danzig Y.	Krupp	Oct. '95	1898	1908		8 Schulz Thornycroft except *Freya* 12 Niclausse	
Hertha	Vulk. Stettin	Vulkan Co.	Sep. '95	1898	1907			
V. Luise	Weser, Bremen	Weser, Bremen	Sep. '95	1898	1907			
Hansa	Vulkan Co.	Vulkan Co.	Mar. '96	1898	1907			
Vineta	Vulkan Co.	Vulkan Co.	Jun. '96	1898	1910			

1895 LARGE GERMAN PROTECTED CRUISERS 1890
(Grosser Geschützter Kreuzer).



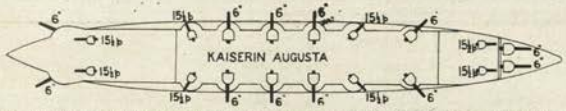
FREYA only of the *Hertha* class (*see previous page*).



Funnels since lengthened.

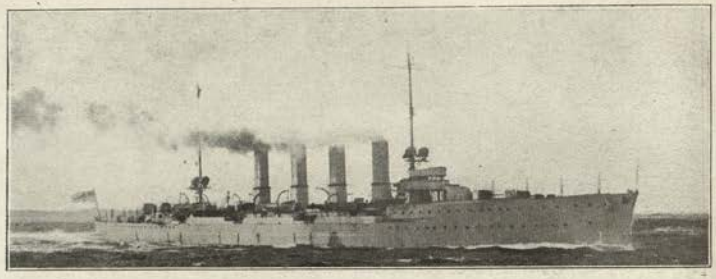
KAISERIN AUGUSTA (1892). Displacement, 6,060 tons. Comp., 436. Length, 388 feet. Beam, 49 feet. Draught, 25½ feet.

Guns: 12—6 inch, 35 cal., 8—15½ pdr., 8 machine. Torpedo tubes: 1 *sub.* (bow), 4 *above water* (broadside).
Armour: 3½″ deck (amidships), 1½″ at ends.



Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: 8 two-ended cylindrical. Designed H.P. *forced* draught 12,000 = 20·7 kts. Coal: 900 tons = *circa* 4,000 miles at 10 kts.

1911 SMALL GERMAN CRUISERS (*Kleine Geschützte Kreuzer*).



KARLSRÜHE (Nov., '12), **ROSTOCK** (Nov., '12), *REGENSBERG* (April, 1914), **GRAUDENZ** (Oct., '13), *ERS. GEFION* (1914), *ERS. HELA* (1914), *E. GAZELLE* (*bldg.*), & *E. NIOBE* (*bldg.*)

Normal displacement, 4900 tons. Complement, 373.
Length, 456 feet. Beam, 45 feet. *Mean* draught, 17 feet.

Guns:
12—4·1 inch.
Torpedo tubes (20 inch):
2 *submerged*

Armour:
4″ Belt (amidships) ..... *d*
2½″ Belt (ends) ..... *e*
2″ Deck .....
Protection to vitals ..... = *e*
4″ Conning tower ..... *d*

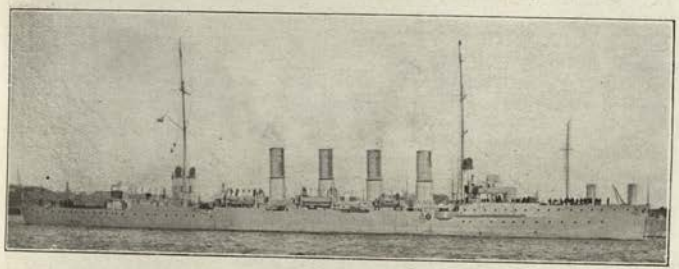
[As *Breslau* class.]

Machinery: Turbine. screws. Boilers: Schulz-Thornycroft. (see note). Designed H.P. 25,500 = 28 kts.
Coal: *normal* tons; *maximum* 1000 tons.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*First trials.*	*Turbines.*	*Best recent speed.*
				to be			
Karlsrühe	Krupp	Krupp	1911	1913			
Rostock	Howalt, Kiel	Howalt	1911	1913			
Regensberg	Weser	Weser	1912	1914			
Graudenz	Kiel Yard	...	1912	1914			
E. Gefion	Vulcan, Stettin	Vulcan	1913	1915			
E. Hela	Kiel Yard	...	1913	1915			
E. Gazelle	...	...	...	...			
E. Niobe	...	...	...	...			

Note.—The first two are 1911, the second two 1912 programme, next two 1913 programme, next last two 1914.

1910 SMALL GERMAN CRUISERS (24·5 knot). **1907**



(Breslau Class—4 Ships).

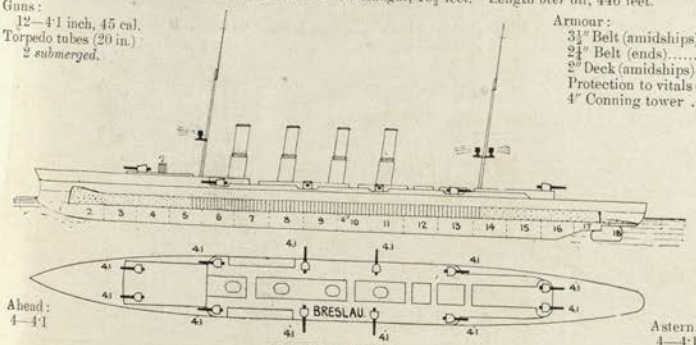
MAGDEBURG (May, 1911), **BRESLAU** (May, 1911), **STRALSUND** (Nov., 1911), **STRASSBURG** (Aug., 1911).

Normal displacement, 4550 tons. Complement, 370.

Length (*w.l.*), 440 feet. Beam, 43 feet. *Mean* draught, 16½ feet. Length *over all*, 446 feet.

Guns:
12—4·1 inch, 45 cal.
Torpedo tubes (20 in.)
2 *submerged*.

Armour:
3½" Belt (amidships) *d*
2¾" Belt (ends)..... *f*
2" Deck (amidships) = Protection to vitals = *e*
4" Conning tower ...*d*



Ahead: 4—4·1

Astern: 4—4·1

Broadside: 6—4·1

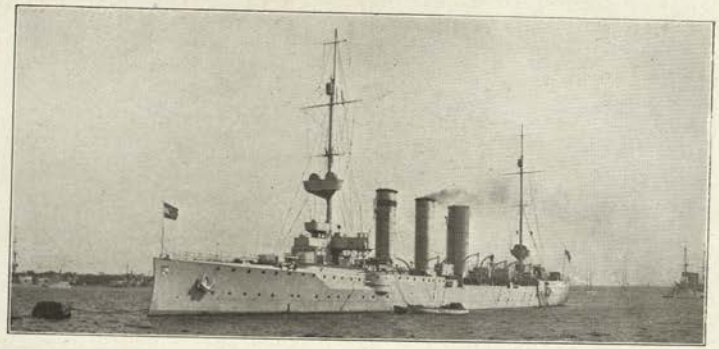
Machinery: Turbine, 1 and 3 Bergmann; 2, A.E.G. (Curtis); 4, Parsons. Boilers: 20 Schulz-Thornycroft. Designed H.P. 22,300 = 25½ kts. Coal: *normal* 750 tons; *maximum* 1200 tons. Oil: 130 tons.

Armour Notes.—Belt is very narrow, and at full load practically submerged.

Engineering Notes.—4 boilers are oil burning.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials (mean)* 6 hours	*Trials (mean)* Best hour	*Turbines*	*Best speed*
Magdeburg	Weser, Bremen	Weser	Ap. '10	June '12	25,735 = 26·9	29,904 = 27·6	Bergmann	...
Breslau	Vulkan, Stettin	Vulkan Co.	Ap. '10	Ap. '12	28,872 = 27·2	33,482 = 27·55	A.E.G. (Curtis)	30
Stralsund	Weser, Bremen	Weser	Ap. '10	June '12	27,952 = 26·9	35,515 = 28·27	Bergmann	...
Strassburg	Wilhelmshaven Y.	...	Ap. '10	Dec. '12	25,647 = 26·9	33,742 = 28·28	Parsons	...

The first two belong to the 1909 programme; the other two to the 1910



(Kolberg Class—4 Ships).

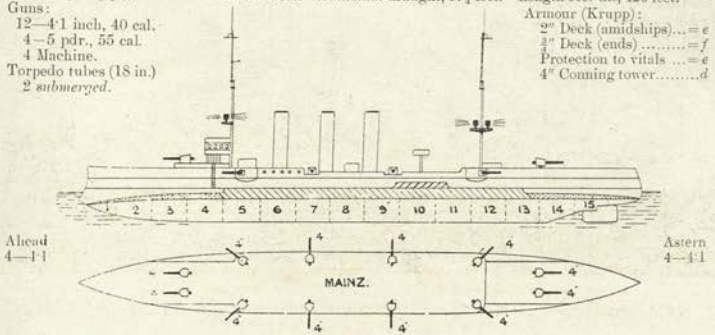
KOLBERG (Nov., 1908), **MAINZ** (Jan., 1909), **KÖLN** (June, 1909) & **AUGSBURG** (July, 1909).

Normal displacement, 4350 tons. Complement, 362.

Length (*p.p.*), 402 feet. Beam 46 feet. *Maximum* draught, 17¾ feet. Length *over all*, 426 feet.

Guns:
12—4·1 inch, 40 cal.
4—5 pdr., 55 cal.
4 Machine.
Torpedo tubes (18 in.)
2 *submerged*.

Armour (Krupp):
2" Deck (amidships)... = *e*
¾" Deck (ends)..... = *f*
Protection to vitals ... = *e*
4" Conning tower.....*d*



Ahead 4—4·1

Astern 4—4·1

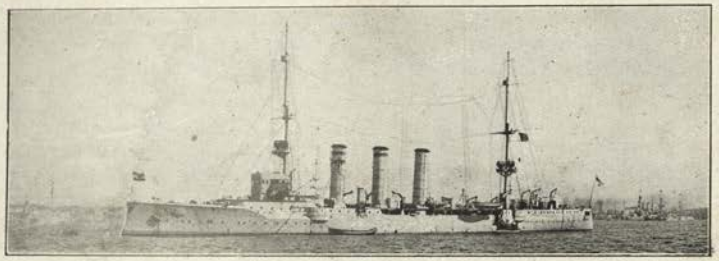
Broadside: 6—4.1 inch.

Machinery: *Kolberg*, Schichau (M. Pfeniger) turbines; *Mainz*, A.E.G. (Curtis) turbines; *Köln*, Zoelly; *Augsburg*, Parsons turbines Boilers: 15 Schulz-Thornycroft. Designed H.P. 20,000 = 25·5 kts. Coal: *normal* 400 tons; *maximum* 900 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Best recent speed*
Kolberg	Schichau	Schichau	Mar. '07	Dec. '09	= 27·2	M. Pfeniger	
Mainz	Vulkan Co.	Vulkan Co.	May. '07	Oct. '09	27,115 = 27·23*	A.E.G. (Curtis)	
Köln	Krupp	Krupp	Sept. '08	Oct. '10	= 26·8	Zoelly	
Augsburg	Kiel Y.		Sept. '08	Oct. '10	= 27	Parsons	

*Max. Mean on other trials only 25.

Average cost per ship complete, £381,480. The *Mainz* damaged her turbines on trial, and is still in a bad way. It is reported that the turbines of the others have also been considerably damaged.



(DRESDEN CLASS—2 SHIPS.)

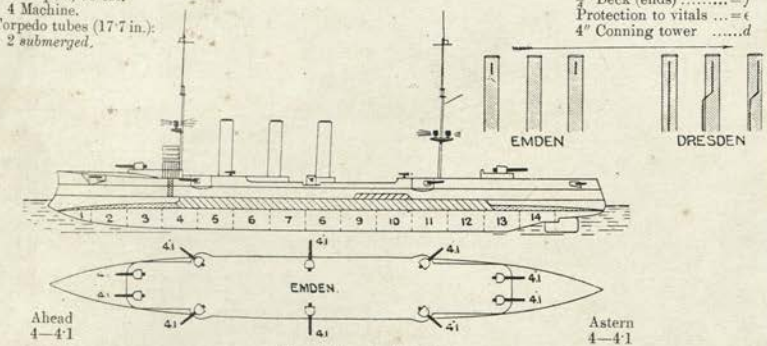
EMDEN (May, 1908), **DRESDEN** (October, 1907).

Normal displacement, 3600 tons. Complement, 321.

Length (*waterline*), 387 feet. Beam, 43½ feet. *Maximum* draught, 17¾ feet. Length *over all*, 395 feet.

Guns:
10—4·1 inch, 40 cal.
8—5 pdr., 55 cal.
4 Machine.
Torpedo tubes (17·7 in.):
2 *submerged*.

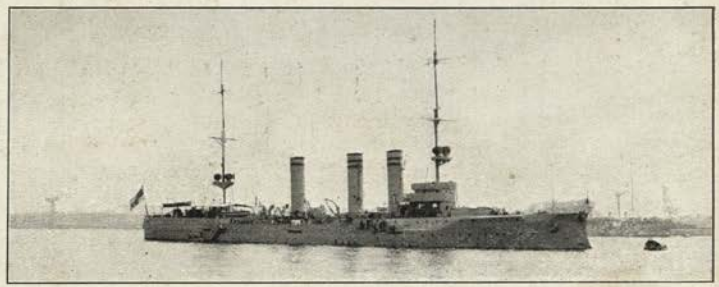
Armour (Krupp):
2″ Deck (amidships)... = *e*
⅜″ Deck (ends) ..... = *f*
Protection to vitals ... = *e*
4″ Conning tower ..... *d*



Broadside: 5—4·1 inch.

Machinery: *Emden*, reciprocating; *Dresden*, Parsons turbine. Boilers: 12 Schulz-Thornycroft. Designed H.P. 13,500 = 24·5 kts. Coal: *normal* 400 tons; *maximum* 900 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*	*Boilers*	*Best speed*
Emden (*r*)	Danzig Yard		June '06	1908		16,390 = 24·12	Schulz-Thornycroft in both	25·1
Dresden (*t*)	Blohm & Voss	Blohm & Voss	Oct., '06	1909		=		...



(STETTIN CLASS—3 SHIPS.)

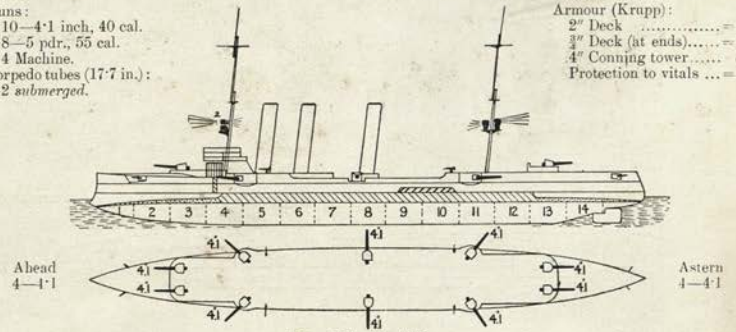
STUTTGART (Sept., 1906), **STETTIN** (March, 1907), and **NÜRNBERG** (Aug., 1906).

Normal Displacement, 3450 tons. Complement, 295.

Length (*waterline*), 354¼ feet. Beam, 44½ feet. *Maximum* draught, 17½ feet. Length *over all*, 360 feet.

Guns:
10—4·1 inch, 40 cal.
8—5 pdr., 55 cal.
4 Machine.
Torpedo tubes (17·7 in.):
2 *submerged*.

Armour (Krupp):
2″ Deck ..... = *e*
⅜″ Deck (at ends)..... = *f*
4″ Conning tower..... *d*
Protection to vitals ... = *e*



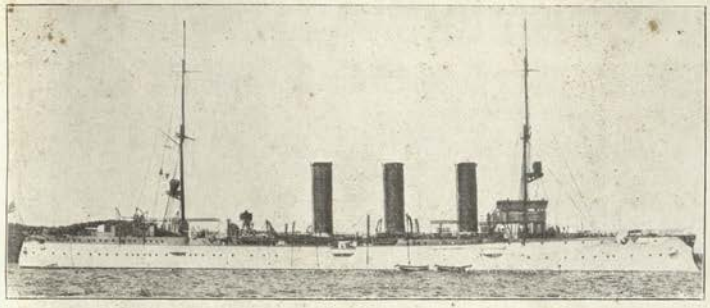
Broadside: 5—4·1 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws except *Stettin*, Turbine (Parsons). Boilers: 11 Schulz-Thornycroft. Designed H.P. 13,200 = 23·5 kts. Coal: *normal* 400 tons; *maximum* 850 tons. *Nominal* radius 5500 knots.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trial on sea course of 170 miles.*	*Boilers*	*Best speed*
Stuttgart (*r*)	Danzig Yard		1905	1908		13,745 = 23·7		
Stettin (*t*)	Vulcan	Vulcan Co.	1905	1908		15,448 = 24*	Schulz-Thornycroft in all.	25·7
Nürnberg (*r*)	Kiel Yard		1905	1908		=		...

Maximum was 19,768 = 24·9. She once touched 21,400 = 25·7.

Average cost per ship complete, £319,000.



Two searchlights now carried on foremast, side by side.

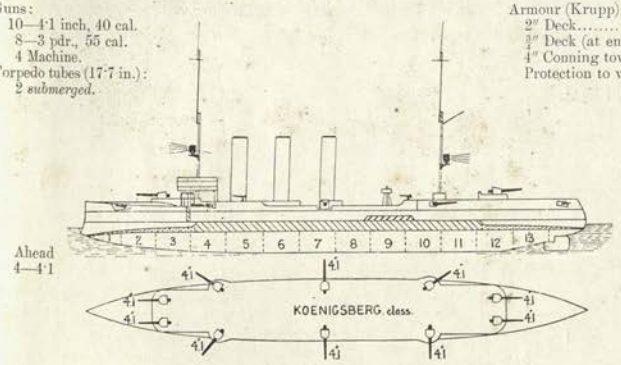
KOENIGSBERG (Dec., 1905).

Normal displacement, 3400 tons. Complement, 295.

Length (*waterline*), 354¼ feet. Beam, 43¾ feet. *Maximum* draught, 17½ feet. Length *over all*, 360 feet.

Guns:
10—4·1 inch, 40 cal.
8—3 pdr., 55 cal.
4 Machine.
Torpedo tubes (17·7 in.):
2 *submerged*.

Armour (Krupp):
2″ Deck..... = *e*
¾″ Deck (at ends).... = *f*
4″ Conning tower ..... *d*
Protection to vitals = *e*



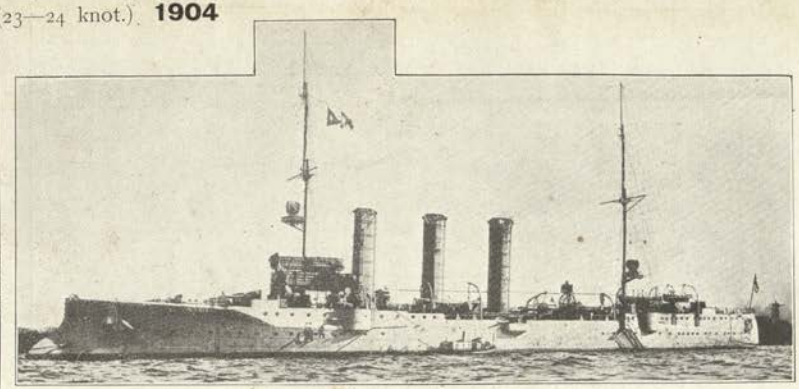
Broadside: 5—4·1 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 11 Schulz-Thornycroft. Designed H.P. 13,200 = 23·5 kts. Coal: *normal* 400 tons; *maximum* 850 tons. *Nominal* radius 5500 kts.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trial on sea course of 170 miles*	*Boilers*	*Present best speed*
Koenigsberg	Kiel Yard		1905	1907		12,797 = 23·6*	Schulz-Thy.	

Maximum 13,918 = 24·1.

Average cost per ship complete £319 000.



(Later Bremen Class—2 Ships.)

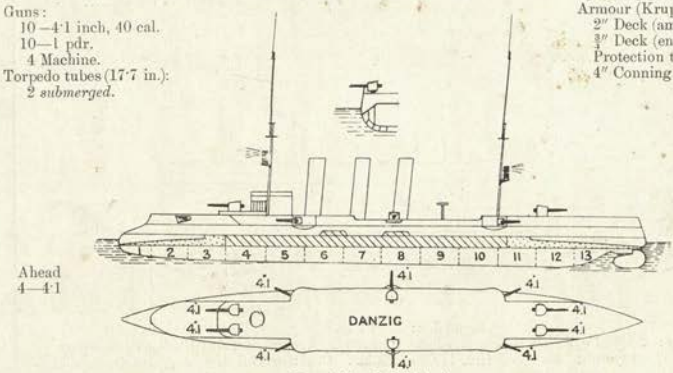
LEIPZIG (March, 1905), & DANZIG (September, 1905).

Normal displacement, 3250 tons. Complement. 286.

Length (*waterline*), 341 feet. Beam, 43¼ feet. *Maximum* draught, 17¼ feet. Length *over all*, feet.

Guns:
10—4·1 inch, 40 cal.
10—1 pdr.
4 Machine.
Torpedo tubes (17·7 in.):
2 *submerged*.

Armour (Krupp):
2″ Deck (amidships) . =*e*
¾″ Deck (ends) .....=*f*
Protection to vitals ... =*e*
4″ Conning tower.....*d*

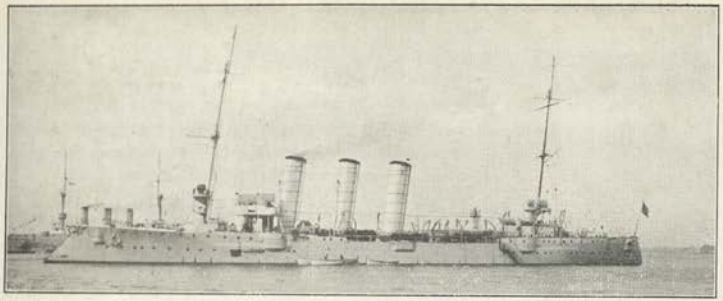


Broadside: 5—4·1 inch.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 10 Schulz-Thornycroft. Designed H.P. 11,000 = 23 kts. Coal: *normal* 400 tons; *maximum* 800 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*		*Boilers*	*Present best speed*
Leipzig	Weser, Bremen	Weser, Bremen	July,'04	Mar.'06		7786 = 20·3	= 23	Schulz-Thy.	
Danzig	Danzig Yard	Danzig Yard	Aug.'04	Jan.'07			12,330 = 22·9	Schulz-Thy.	23·7

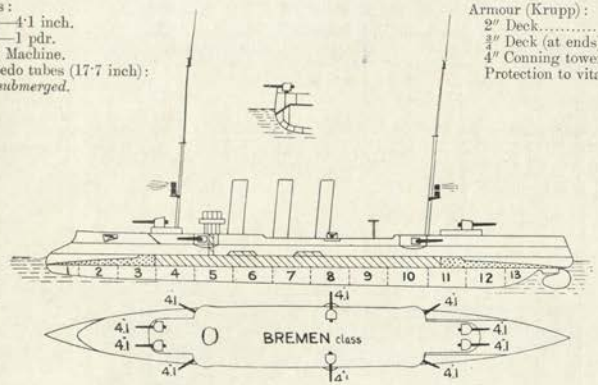
Note.—Altered position of foremast from earlier models.



BREMEN (July, 1903), **HAMBURG** (July, 1903), **BERLIN** (September, 1903), **LUEBECK** (March, 1904), and **MUENCHEN** (April, 1904).
Normal displacement, 3250 tons. Complement, 286.
Length (*waterline*), 341 feet. Beam, 43½ feet. *Maximum* draught, 17½ feet.

Guns:
10—4·1 inch.
10—1 pdr.
4 Machine.
Torpedo tubes (17·7 inch):
2 *submerged*.

Armour (Krupp):
2″ Deck.....= *e*
3″ Deck (at ends).....= *f*
4″ Conning tower ..... *d*
Protection to vitals .....= *e*



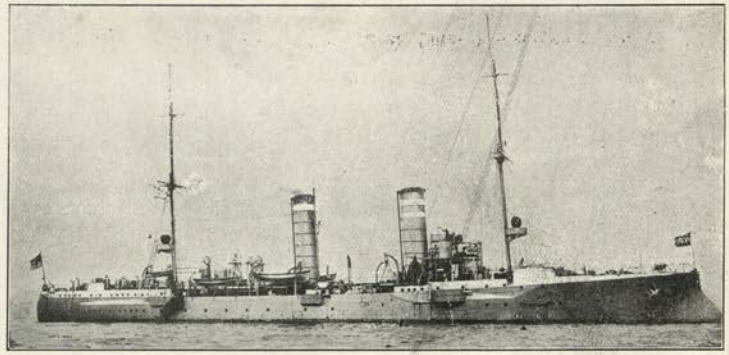
Ahead: 4—4·1.
Astern: 4—4·1.

Broadside: 5—4·1 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. *Luebeck*, turbine (Parsons), 8 screws. Boilers: 10 S.-Thornycroft. Designed H.P. 11,000=23 kts. Coal: *normal* 400 tons; *maximum* 800 tons. *Nominal* radius 5000 at 10 knots.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trial on sea course of 170 miles.*		*Boilers.*	*Present best speed*
Bremen	Weser, Bremen		1902	1904		7160=20·2	12,100=23·2	Schulz-Thornycroft in all.	23·2
Hamburg	Vulkan, Stet'n		1902	1904		7244=20·4	11,400=23·1		23·3
Berlin	Danzig D'cky'd		1902	1904		7121=21	10,857=23·2		23·5
Luebeck	Vulkan, Stet'n		1903	1904			11,580=23·5		23·5
München	Weser, Bremen		1903	1905		7200=20·4	12,388=23·4		23·2

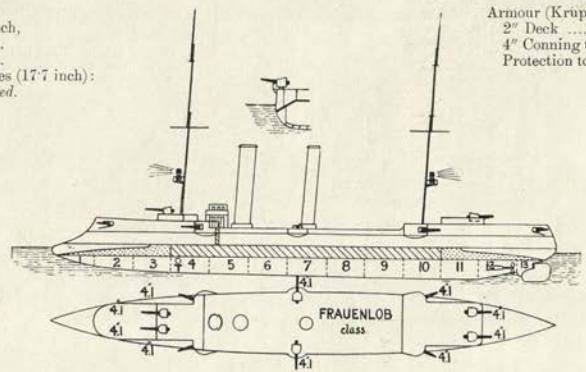
1902 SMALL GERMAN CRUISERS (21·5 knot). **1900**



FRAUENLOB (March, 1902), **ARCONA** (April, 1902), & **UNDINE** (Dec., 1902).
Displacement, 2,715 tons (sheathed). Complement, 264.
Length, 328 feet. Beam, 40 feet. *Maximum* draught, 17¼ feet.

Guns:
10—4·1 inch,
10—1 pdr.
4 Machine.
Torpedo tubes (17·7 inch):
2 *submerged*.

Armour (Krupp):
2″ Deck .....= *e*
4″ Conning tower ..... *d*
Protection to vitals...= *e*



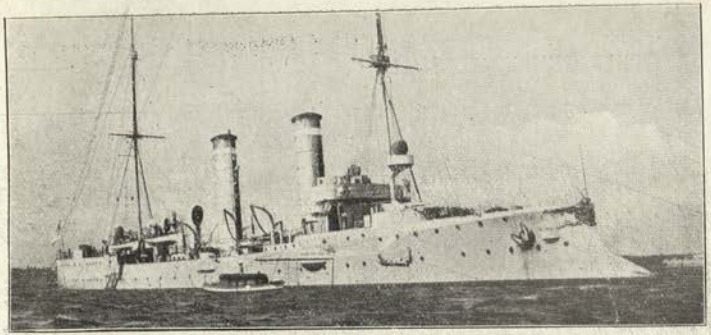
Ahead: 4—4·1 in.
Astern: 4—4·1 in.

Broadside: 5—4·1 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Designed H.P. 8,500=21·5 kts. Coal: *normal* 450 tons; *maximum* 700 tons. Boilers: 9 Schulz-Thornycroft.

Name.	*Where built.*	*Machinery.*	*Laid down.*	*Completed.*	*Refit.*	*Trials.*	*Boilers.*	*Best recent speed.*
Frauenlob	Weser Bremen		1900	1903		=21·7 kts.	Schulz in all	21
Arcona	Weser Bremen		1900	1903		=21·5 kts.		21·4
Undine	Howadt, Kiel		1901	1903		= kts.		—

Coal consumption: about 7¼ tons an hour, at 8,000 H.P. (21·5 kts.). Fitted as minelayers.



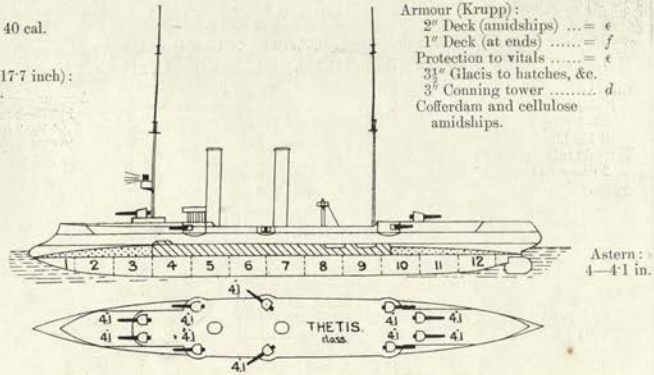
NYMPHE (1899), **THETIS** (1900), **ARIADNE** (1900), **AMAZONE** (1900), & **MEDUSA** (1900).

Normal displacement, 2,660 tons. (Sheathed and Muntz metalled). Complement, 264.

Length (*waterline*), 328 feet. Beam, 40½ feet. *Maximum* draught, 17¼ feet.

Guns:
10—4·1 inch, 40 cal.
14—1 pdr.
4 Machine.
Torpedo tubes (17·7 inch):
2 *submerged*.

Armour (Krupp):
2″ Deck (amidships) ...= ϵ
1″ Deck (at ends) .....= *f*
Protection to vitals .....= ϵ
3½″ Glacis to hatches, &c.
3″ Conning tower ..... *d*
Cofferdam and cellulose amidships.



Ahead: 4—4·1 in.

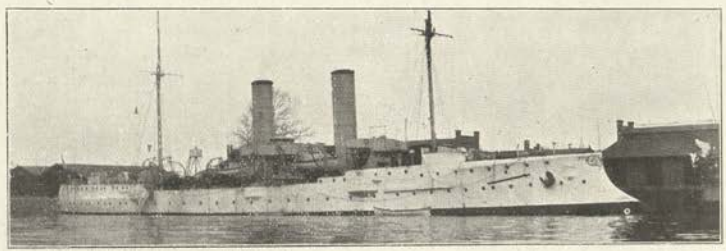
Astern: 4—4·1 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: Schulz. T. Designed H.P. 8500=21 kts. Coal: *normal* 300 tons; *maximum* 560 tons (always carried).

Engineering Notes.—In these ships, as a rule, 79 revolutions=11 kts.; 87=12 kts.; 127=17 kts.; 140=19·5 kts.; 166=21·6 kts.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Trials.*	*Boilers.*	*Best recent speed.*
Nymphe	Krupp	Krupp	1898	1901	9,000=22·3		19·5
Thetis	Danzig Yard		1899	1901	8,888=21·75	5 Schulz-Th in all	
Ariadne	Weser,Bremen	Weser	1899	1901	8,827=21·18		
Amazone	Krupp	Krupp	1899	1901	8,850=21·5	4 double-ended	
Medusa	Weser,Bremen	Weser	1900	1901	8,927=22·0		21·5

Nymphe fitted as minelayer. *Thetis* and *Amazone* to be fitted.



Only *Gazelle* has bridge between funnels. *Niobe* as *Thetis* class.

(Gazelle Class—2 Ships).

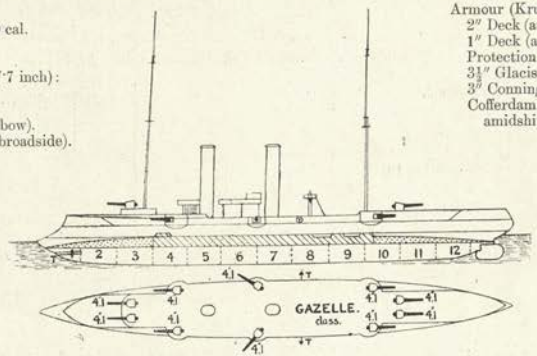
GAZELLE (1898), & **NIOBE** (1899).

Normal displacement, 2645 tons. (Sheathed and Muntz metalled). Complement, 264.

Length (*waterline*), 328 feet. Beam, 39 feet. *Maximum* draught, 17¼ feet.

Guns:
10—4·1 inch, 40 cal.
14—1 pdr.
4 Machine.
Torpedo tubes (17·7 inch):
2 *submerged*.
but *Gazelle* has
1 *above water* (bow).
2 *above water* (broadside).

Armour (Krupp):
2″ Deck (amidships)...=ϵ
1″ Deck (at ends) ...=*f*
Protection to vitals ...=ϵ
3½″ Glacis to hatches, &c.
3″ Conning tower.....*d*
Cofferdam and cellulose amidships.



Ahead: 4—4·1 in.

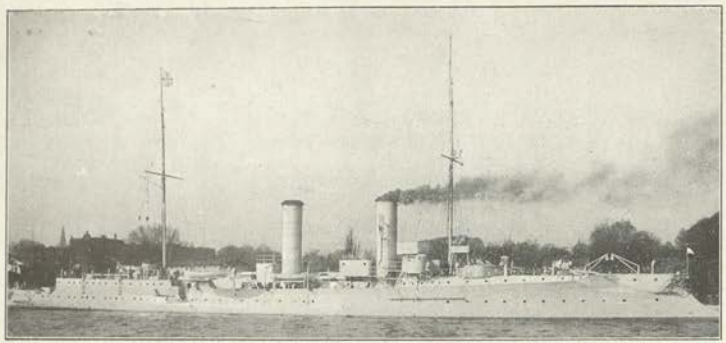
Astern: 4—4·1 in.

Broadside: 5—4·1 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: *See Notes.* Designed H.P. 8500=21 kts. Coal: *normal* 300 tons; *maximum* 560 tons (always carried).

Engineering Notes.—In these ships, as a rule, 79 revolutions=11 kts.; 87=12 kts.; 127=17 kts.; 140=19·5 kts.; 166=21·6 kts.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials.*	*Boilers*	*Best recent speed*
Gazelle	Krupp	Krupp	1897	1898	6,400=19·5	8 Niclausse	
Niobe	Weser, Bremen	Weser, Bremen	1898	1899	8,115=21·6	9 Thornycroft	



HELA (1895) (1910).

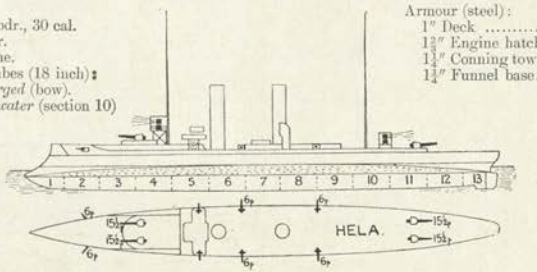
Displacement, 2040 tons. Complement, 178.

Length, 328 feet. Beam, 36 feet. *Maximum* draught, 15¾ feet.

Guns:
4—15½ pdr., 30 cal.
6—6 pdr.
2 machine.

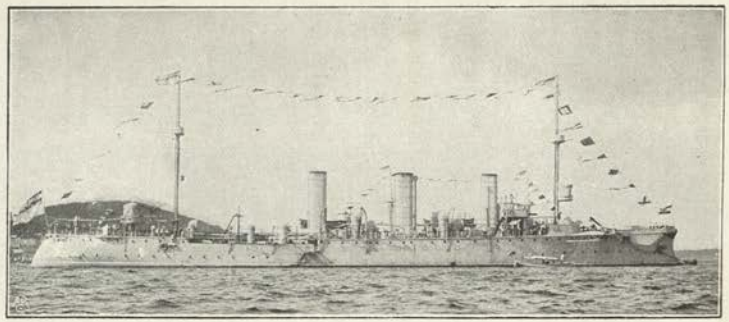
Torpedo tubes (18 inch):
1 *submerged* (bow).
2 *above water* (section 10)

Armour (steel):
1″ Deck .....
1½″ Engine hatches .....
1¼″ Conning tower.....
1½″ Funnel base.....



Machinery: 2 sets vertical triple expansion. 2 screws. Boilers (1910): S. Thornycroft.
Designed H.P. 6000 = 20·5 kts. Coal: 330 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*First trial*	*Boilers*	*Best recent speed*
Hela	Weser, Bremen	Weser	1893	1896	1910	6000 = 20·9	S. T.	18



GEFION (1893).

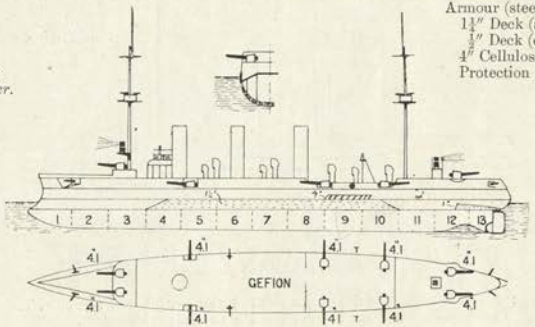
Displacement, 3,770 tons. Complement, 302.

Length (*waterline*), 325 feet. Beam, 42½ feet. *Maximum* draught, 21½ feet. Length *over all*, 334 feet.

Guns:
10—4·1 inch
6—4 pdr.
8 Machine.

Torpedo tubes:
2 *above water*.

Armour (steel):
1½″ Deck (amidships) ... =
¾″ Deck (ends) ..... =
4″ Cellulose belt .....
Protection to vitals ..... = *d*

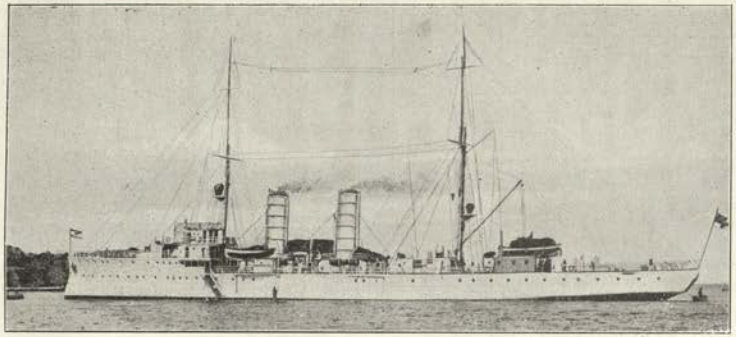


Ahead:
2—4·1 in.

Astern:
1—4·1 in.

Broadside: 5—4·1 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: six 2-ended cylindrical. Designed H.P. *forced* 9,000 = 20 kts. Coal: *maximum* 750 tons.
Engineering Notes.—4 hours *forced* draught, I.H.P. 9,828 = 20·5 kts. Coal consumption: about 2½ tons an hour at 10 kts.; 9 tons at 9,000 H.P. = 20 kts.
Built by Schichau, Danzig. Laid down 1892. Completed 1894. Last refit, 1905.

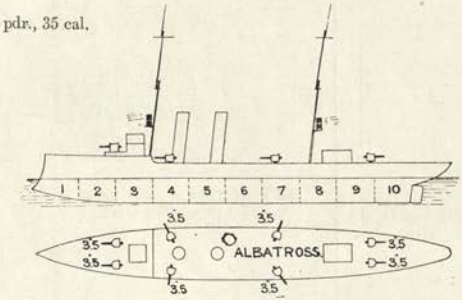


ALBATROSS (October, 1907).

Displacement, 2200 tons. Complement, 189.

Length, 262 feet. Beam, 39½ feet. *Maximum* draught, *about* 16 feet.

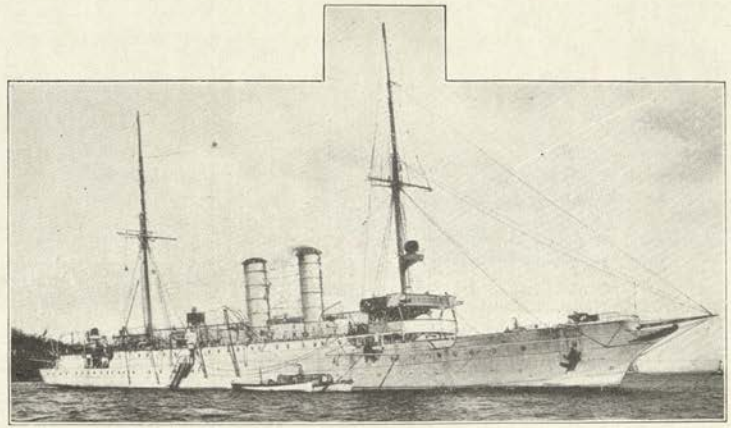
Guns:
8—3·5 inch, 24 pdr., 35 cal.



Machinery:
Coal: *normal*, tons; *maximum*, tons

Boilers: Schulz-Thornycroft. Designed H.P. 5500=21 kts.

Notes.—See *Nautilus*.



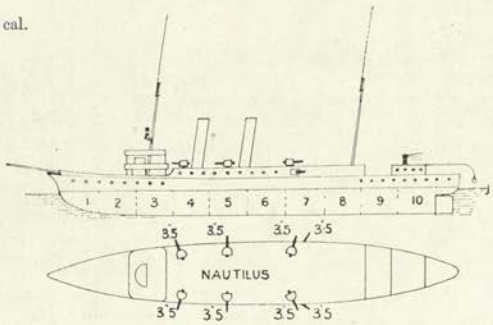
NAUTILUS (1906).

Displacement, 1970 tons. Complement, 189.

Length, 256 feet. Beam, 39½ feet. Draught, 15 feet.

Guns (*see Notes*):
8—3·5 inch, 35 cal.

Armour:
Nil



Machinery:
maximum, tons.

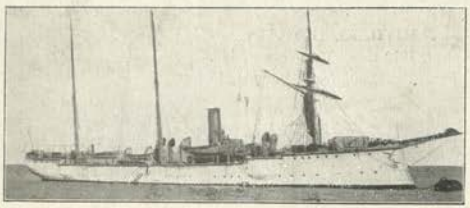
Designed H.P. 5000=20 kts. Coal: *normal*, tons;

Notes.—Built by Weser, Bremen. This ship can act as ice breaker or boom charger as well as mine layer. Specially strong bows. The 2 main deck 3·5's have now been mounted on the upper deck. Both *Nautilus* and *Albatross* carry 400 mines each.

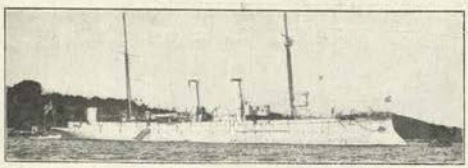
Unprotected Cruisers (*Ungeschützte Kreuzer*).

GEIER (1894), **CONDOR** (1892), **CORMORAN** (1892), **SEE-ADLER** (1892). 1630 tons. Guns: 8—4·1 inch, 5—1 pdr. Torpedo tubes: 2—14 inch. Speeds: 17—15 kts.

Subsidiary Service.

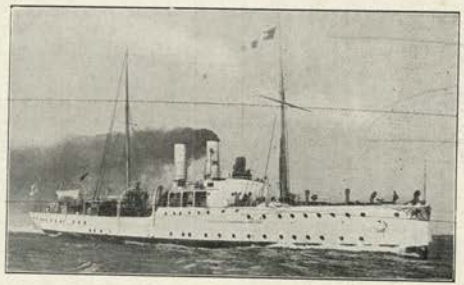


SCHWALBE (1887). 1120 tons. Guns: 8—4·1 inch, 5—1 pdr. Tubes: 2—14 inch. Speed: under 14 kts.

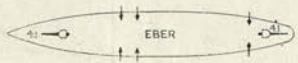


BLITZ & **PFEIL** (—1882). 1390 tons. Guns: 6—15 pdr. Speed: about 15 kts.

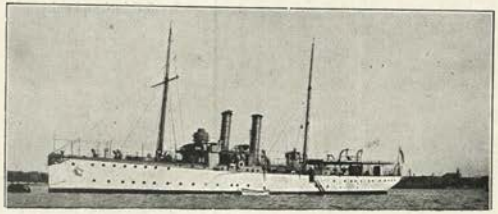
Gunboats (*Kanonenboote*).



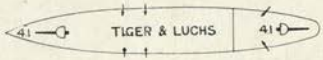
EBER (June, 1903), & **PANTHER** (April, 1901). Displacement 1000 tons. Complement 125. Guns: 2—4·1 inch, 40 cal.; 6—1 pdr.; 2 Machine.



Machinery: Triple expansion. 2 screws. Boilers: 4 Schulz-Thornycroft. Designed H.P. 1350=14 kts. Coal: 200 tons. *Nominal* radius 2500 miles.

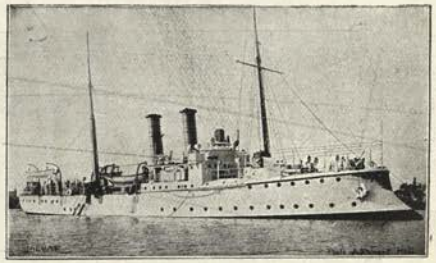


TIGER (August, 1899), **LUCHS** (October, 1899). Displacement 900 tons. Complement 121. Guns: 2—4·1 inch, 40 cal.; 6 –1 pdr.; 2 Machine.

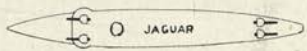


Machinery: Triple expansion. 2 screws. Boilers: 4 Thornycroft. Designed H.P. 1350=14 kts. Coal: 200 tons. *Nominal* radius 2500 miles at 10 kts.

Gunboats—(*Continued*).

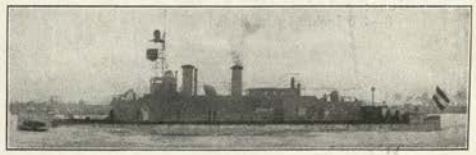


ILTIS (October, 1898), **JAGUAR** (November, 1898). Displacement 900 tons. Complement 121. Guns: 4—15½ pdr.; 6—1 pdr.; 2 Machine.



Machinery: 2 sets triple expansion. 2 screws. Boilers: 4 Thornycroft. Designed H.P. 1400=14 kts. Coal: *normal* 120 tons; *maximum* 165 tons. *Nominal* radius (*maximum*) 3000 miles.

River Gunboats.



OTTER (1909). 260 tons. Guns: 2—4 pdr. Speed: 14 kts. Bullet-proof sides, etc.

VATERLAND & **TSINGTAU** (1903). 168 tons. Guns: 1—15½ pdr., 1—4 pdr. Speed: 13 kts. Bullet-proof sides, etc.

152 + *12* Destroyers.

Totals.	Class.	Begun.	Completed.	Displacement.	*Nominal* H.P.	*Nominal* Speed.	Coal.	Complement.	*Max.* draught.
				tons.		kts.	tons		feet.
12	48—37	1913	1915	...	...	...	...	...	...
6	S 36—31	1912	1913	820	15,000	32·5	200+oil	73	...
6	V 30—25	1912	1913						...
12	S 24—13	1911	1912						...
12	G 12—7 V 6—1	1911	1912	*about* 650	16,000*t*	32·5	200+oil	73	...
12	G197—192 V191—186	1910	1911						
11*	V185—180 S179—176 G175—174	1909	1910	*about* 650	16,000*t*	32·5	180	82	...
12	S168—165 G173—169 V164—162	1908	1909	*about* 620	14,000*t*	32	160	82	
12	V 161—150	1907	1908	680	10,250*t*	30	175	83	10
12	S 149—138	1906	1907	525	10,000	29½	170	72	8
1	G 137	1905	1907	572	10,000 *t*	33·9	170	80	10
5	G 136—132	1905	1907	486½	6000	28½	135	68	8½
6	S 131—126	1904	1906	487	6000	28		68	8½
6	S 125—120	1903	1905	420	6500	28	116	60	9
6	S 119—114	1902	1904	420	6500	28	112	60	9
6	G 113—108	1901	1903	400	5600	28	116	60	9
6	S 107—102	1900	1902	400	5400	27			9
12	S 101—90	1899	1900	400	5400	26½			9
1	*Taku*	1897	1899	280	6000	30	57	49	8
1	D 10 (Ty.)	1897	1899	355	5500	28	116	60	9½
1	D 9	1893	1894	380	4040	24½	109	59	10½
2	D 8, D 7	1890	1892	350	4000	23	76	49	10
2	D 6, D 5	1888	1890	320	3600	23	86	49	10¼
2	D 4, D 3	1887	1889	300	2500	21	60	49	9½

G=Germania (Krupp built). S=Schichau. Ty.=Thornycroft. V=Vulcan Co.

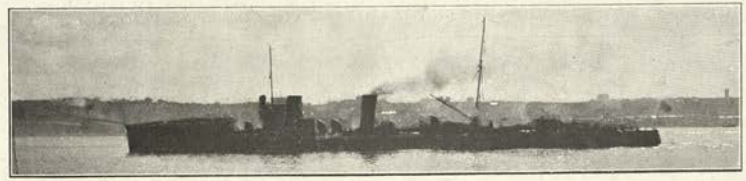
*G 171 has been lost.

Note.—These German destroyers are excellent sea boats, strongly constructed, and, in every case, tested by acceptance trials in really bad weather in order to guarantee against leaking or straining.

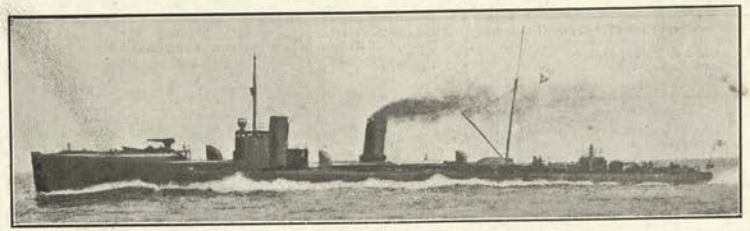
German destroyers are now generally built in about 12-15 months.

Same appearance as Krupp (G) type or V type as below.

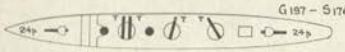
S 36—31, V 30—25 (1912-13) and ***S 24—13*** (1911). *Schichau* type. Armament: 2—3·5 inch (24 pdr.), 8—20 inch tubes (twins). Turbine. Designed H.P., 15,000=32·5 kts. Fuel: utmost capacity is 200 tons coal and 70 tons oil. Specially wide bunkers. On trial *S 15* reached 36·5 kts. with about 22,000 I.H.P.



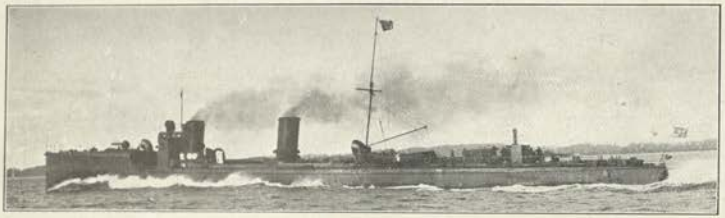
G 12—7 (1911). *Krupp, Germania* type. Armament: 2—3·5 inch (24 pdr.), 2 M., 5 tubes (20 inch). Parsons turbine. Coal: 200 tons. Designed H.P. 16,000=32·5 kts.



V 6—1 (1911). Turbines. Curtis (A.E.G.), *Vulcan* type. Guns: 2—24 pdr. 5—20 inch tubes. Coal: 200 tons. Speeds: up to 35 kts.



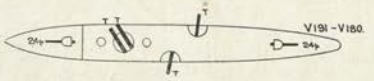
1911-09 GERMAN DESTROYERS. 1909-08

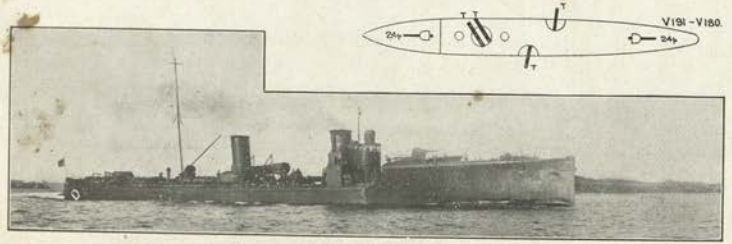


8 *Germania* (Krupp) boats. **G 197–192** and **G 175–174.** 654 tons. Armament: 2–24 pdr., 2 M. 4–18 inch tubes. H.P. 16000=31·5 kts. Parsons' turbines. Schulz-Thornycroft boilers. Coal: 180 tons. Complement, 82.

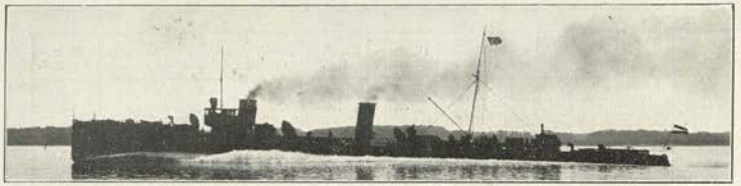
Same appearance as above.

3 *Schichau* boats. **S 179–176.** 636 tons. Armament: 2–24 pdr., 2 M. 4–18 inch tubes. H.P. =32 kts. Turbines: Mills-Pfenniger (Schichau). Schulz-Thornycroft boilers. Coal: 180 tons. Complement, 82.
Note.—178 lost March, 1913.





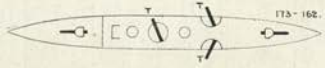
12 *Vulcan* boats. **V 191–186,** *also* **V 185–180.** Armament: 2–24 pdr., 35 cal., 2 M. 3–18 inch tubes. H.P. =32·5 kts. Turbines: A.E.G. (Curtis). Schulz-Thornycroft boilers. Coal? 180 tons. Complement, 82.

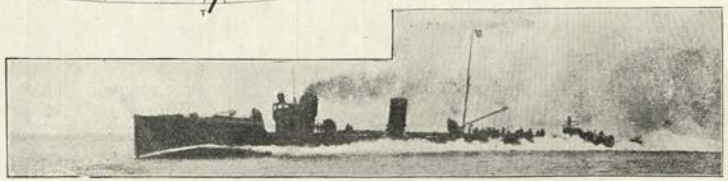


4 *Germania* (Krupp) boats. **G 173–169.** 636 tons. Armament: 2–24 pdr., 2 M. 3–18 inch tubes. Turbines: Parsons, except *G 173* (Zoelly). Boilers: Schulz-Thornycroft. Designed H.P. 14,000=32 kts. Coal: 140 tons. Complement, 82.
Note.—G 171 lost.

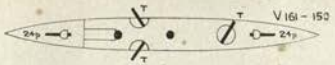
Same appearance as above.

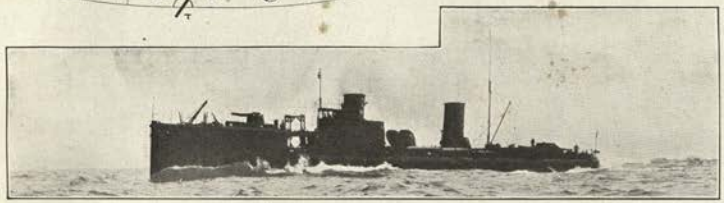
4 *Schichau* boats **S 168–165.** 615 tons. Armament: 2–24 pdr., 2 M. 3–18 inch tubes. Turbines: M-P (Schichau). Designed H.P. 14,000=32 kts. Boilers: Schulz-Thornycroft. Coal: 140 tons. Complement 82.



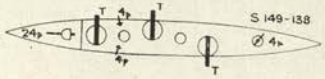


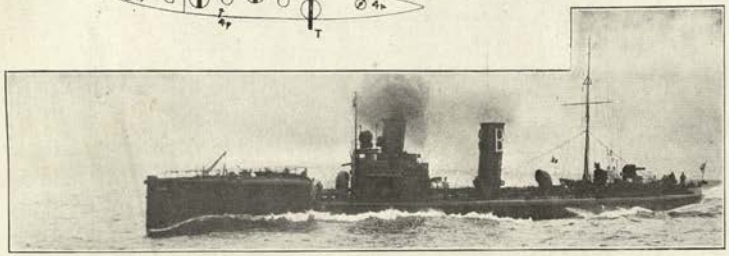
3 *Vulcan* boats. **V 164–162.** 613 tons. Armament: 2–24 pdr., 30 cal., 2 M. 3–18 inch tubes. Machinery: A.E.G. (Curtis) turbines. Schulz-Thornycroft Boilers. Designed H.P. 14,000=32 kts. Coal: 140 tons. Complement, 82.



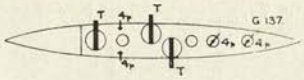


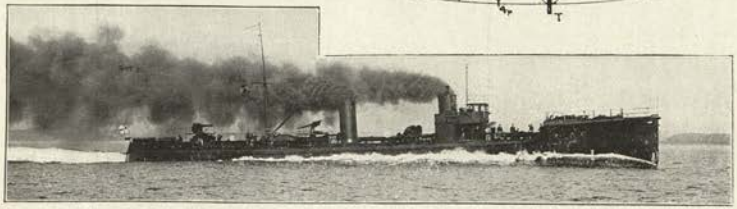
12 *Vulcan.* ***V 161—150.*** 680 tons. Armament: 2—24 pdr., 2 M. 3—18 inch tubes. *Max.* radius 2000 miles. *161* has Curtis turbines. Designed H.P. 10,250=30 kts. Complement, 82.



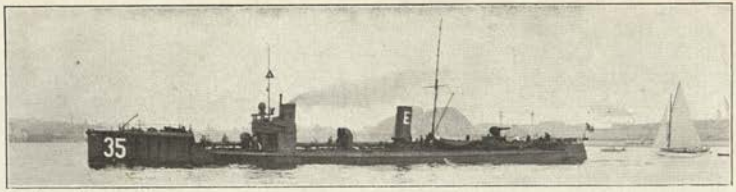


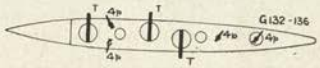
12 *Schichau.* ***S 149—138.*** 525 tons. Armament: 1—24 pdr., 3—4 pdr., 2 M. 3—18 inch tubes. *Max.* radius 2000 miles. Machinery: reciprocating. 4 Schulz-Thornycroft boilers. Designed H.P. 10,000=30 kts. Coal: 170 tons.



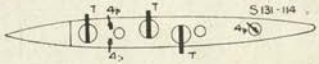


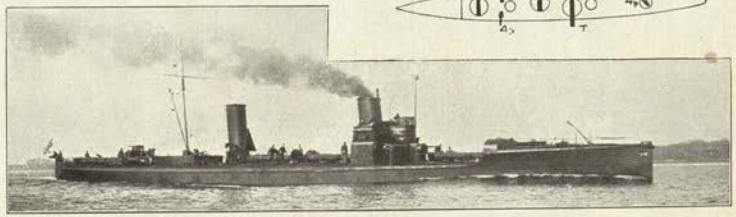
1 *Krupp.* ***G 137.*** 572 tons. Armament: 4—4 pdr., 55 cal., 2 machine, 3—18 inch tubes. Parsons turbines. Made 33·9 on trial. Designed H.P. 10,800=32 kts. Coal: 170 tons Complement, 63.



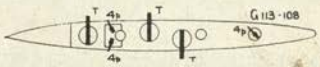


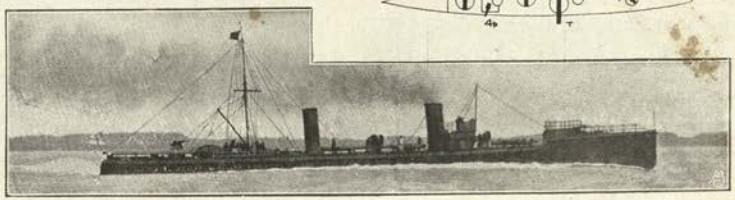
G 136—132. Armament: 4—4 pdr., 55 cal. G 135 has special armament, 1—15 pdr., 2—4 pdr. *Max.* radius, 2000 at 12 kts. 3—18 inch tubes.



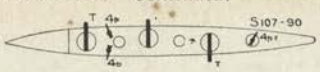


S 131—114. Armament: 3—4 pdr., 2 machine. 3—18 inch tubes. Radius, 1400 miles at 15 kts., at full speed about 500 miles. S 125 has Parsons' turbines and made 29·5 kts. on trial.

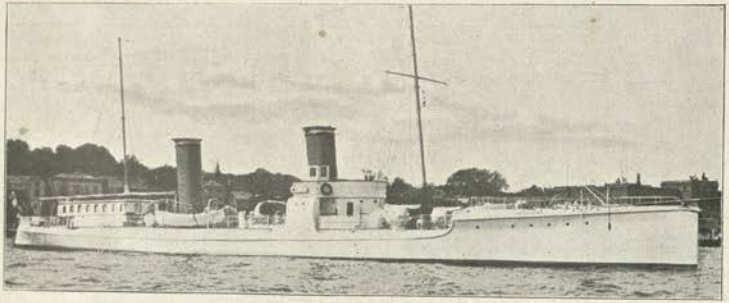




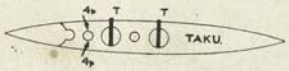
G 113—108. Armament: 3—4 pdr., 2 machine. 3—18 inch tubes. Radius 1400 miles at 15 kts., 500 at full speed.

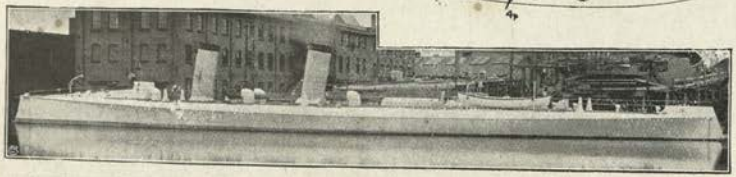


S 107–90 *except* S 97 *(Sleipner).* Details as above. Can do about 25 kts. in service.

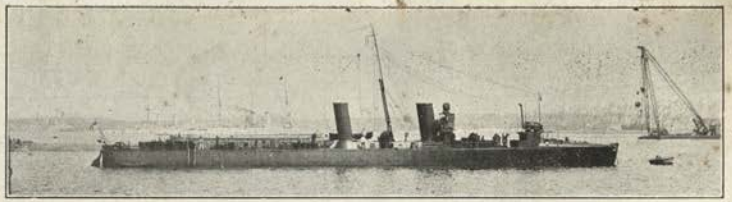


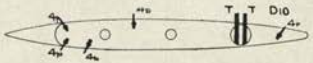
S 97 *(named* **Sleipner***).* Details as above. Used as escort to Imperial Yacht.



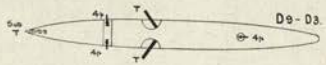


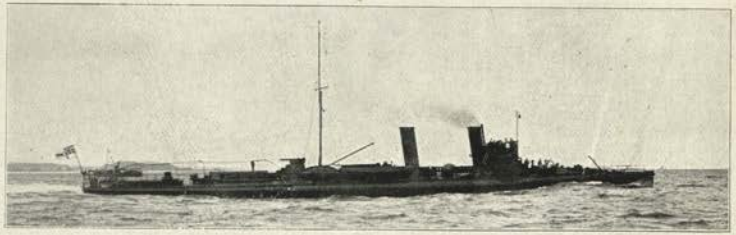
Taku. Armament: 2—4 pdr., 2—15 inch tubes. Radius *(nominal)* 2000 miles at 12 kts.



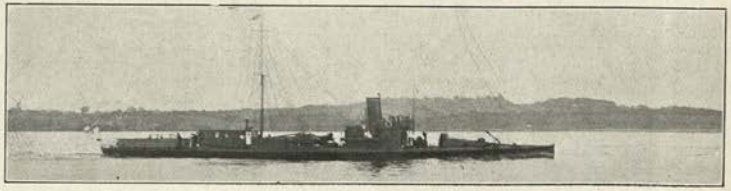


D 10 *(Thornycroft boat).* Armament: 5—4 pdr., 3—18 inch tubes. Boilers: Yarrow, recently fitted experimentally.





D9—D7 & D5—D3. Armament: 3—4 pdrs., 3—18 inch tubes in bow, *submerged.* Mostly reconstructed and given two funnels 1907-09.



D 6. Details as for *D9—D7.*

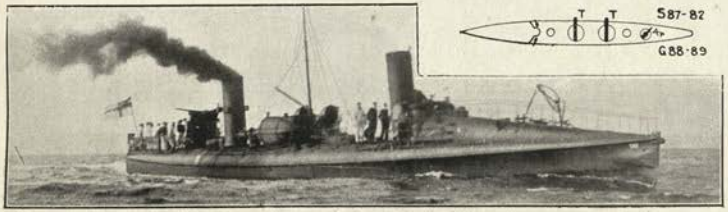
45 Torpedo Boats.

(Single screw. All armed with 1-4 pdr. gun, and draw about 7½ feet.)
Tubes: 14 inch.

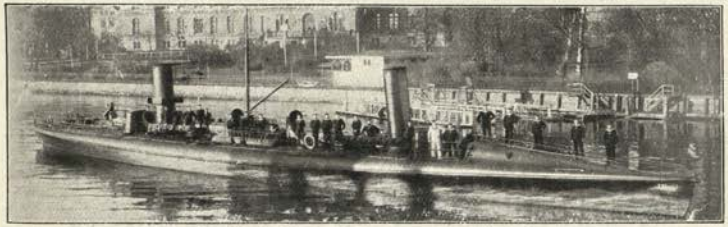
Totals.	Name or Number.	Date.	Displacement.	I.H.P.	*Max.* Speed.	Torpedo Tubes.	Coal.	Complement.
			tons.		kts.		tons.	
2	G 88 & 89	1898	155	1800	25	2	37	24
6	S 87—82	1898	155	1800	25	3	37	24
6	S 81—78, 76, 74...	1895	153	1800	25	4	53	24
1	S 75—78	1892	145	1800	26	4	40	20
6	S 73—70, 68, 66	1890	170	1800	22	3	—	24
8	S 65—58	1889	153	1800	22	3	53	24
9	T 57—49	1887	130	1500	22	3	—	21
6	T 47—43, S 42...	1887	145	1350	22	3	40	16
1	S 32	...	...	...	19	2	...	...

Also several old second class boats for harbour service, 17 knot speed or so.
77, 69, 67 struck off list.

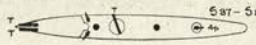
Boats from T 57 downwards were known as S, same numbers up to Nov., 1910. All are Schichau boats. G=Krupp.

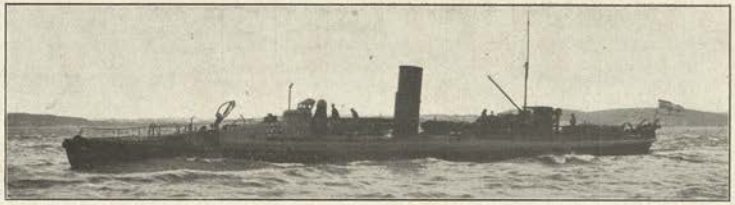


G 88—G 89.

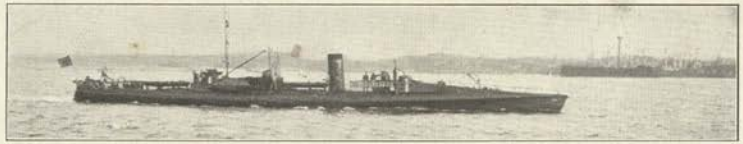


S 87—82.

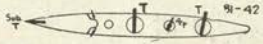


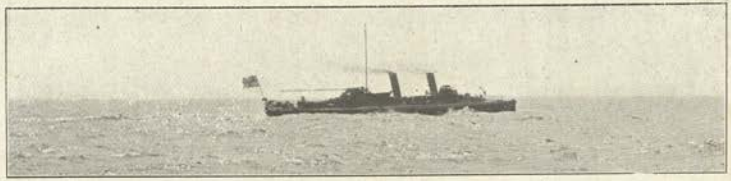


S 81—74.

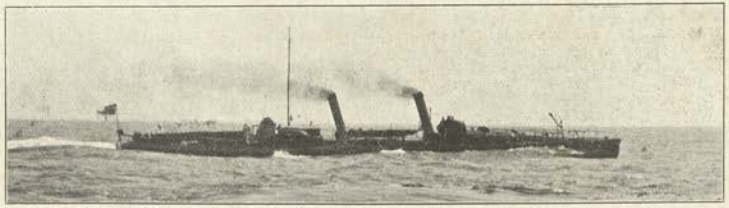


Older boats. ***S 73—T 43.*** Of these, *T 46* has been converted experimentally to Diesel motors.





S 42. (Re-engined and re-boilered).



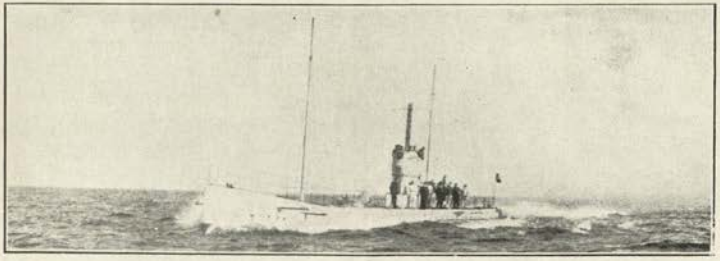
S 32. (Re-engined and re-boilered).

30 + ? Submarines (*Untersee boote*).

(All Germania type, built at Krupps or at Danzig yard).

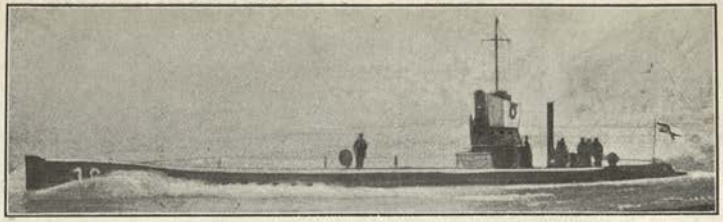
No.	Date.	Class.	Displacement. above / submerg'd	Motive Power, above water.	H.P. above / below	Speed. above / below	*Max.* Radius in miles.	Tubes.	Complement
?	1914-15	U	?	...	...	..	...	...	...
1	1913-14	Fiat	?	?	?	?	?	?	?
6	1913-14	U 30—25	(?) 800	Heavy oil	...	$\frac{18}{?}$ (?)	...	4	...
6	1912-13	U 24—19	$\frac{650}{750}$	Heavy oil	$\frac{1400}{500}$	$\frac{14}{8}$	2000	4	...
		U 18—17						4	
6	1911-12	U 16—15	$\frac{250}{300}$	Heavy oil	$\frac{450}{150}$	$\frac{13}{8}$	1200	3	12
4	1910-11	U 12—9							
		U 8							
4	1908-10	U 7—5	$\frac{210}{250}$	Heavy oil	$\frac{400}{150}$	$\frac{13}{8}$	1000	2	11
3	1906-07	U 4—2							
1	1904-06	U 1	$\frac{197}{236}$	Heavy oil	$\frac{250}{100}$	$\frac{10}{7}$	700	1	9

The whole of the above are fitted with submarine signalling apparatus. Average time to submerge is 25 to 30 seconds. Some boats carry searchlights. Early boats have 6-cyl. Nuremburg motors. Later have Krupp and Nuremburg motors: but some are fitted with Augsburg 2-cycle motors (M.A.N.) All boats after and including *U 15* have sleeping accommodation. The programme provides for 72 boats by end of 1917.

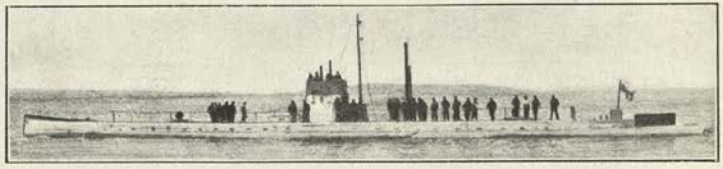


U 30—25. tons. Armament: 2—14 pdr. disappearing 2—1 pdr. high angle, 4 tubes (2 forward, 2 aft.)

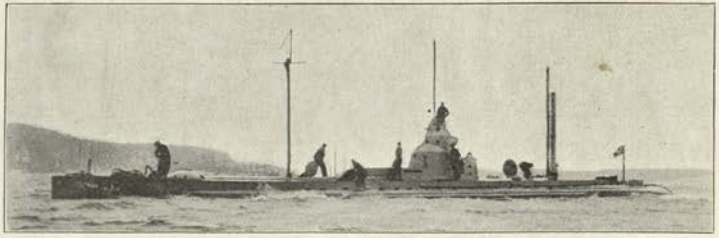
U 24—17. $\frac{650}{750}$ tons. Armament: 1—14 pdr. disappearing, 2—1 pdr. high angle, 4 tubes (2 bow, 2 stern).



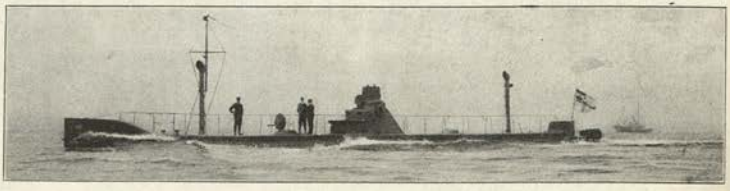
U 16—13. $\frac{250}{300}$ tons. (As below.)



U 12—8. $\frac{250}{300}$ tons. Armament: 3—18 inch tubes, 2—1 pdr. high angle (2 forward, 1 aft. H.P. $\frac{450}{150} = \frac{13}{8}$ kts.

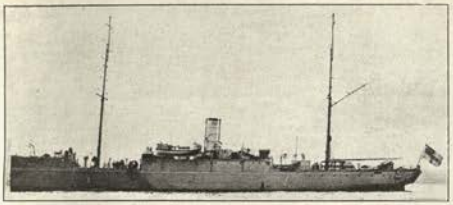


U 7—2. $\frac{210}{250}$ tons. Dimensions: 139×9×9 feet. Armament: 2—18 inch bow tubes. H.P. $\frac{400}{150} = \frac{12}{8}$ These boats are over engined and suffer from excessive vibration.

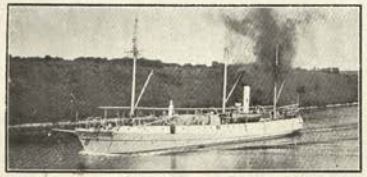


U 1 (1905). $\frac{197}{256}$ tons. Dimensions: 128×9×9 feet. Armament: 1—18 inch bow tube. H.P. $\frac{250}{100} = \frac{10}{7}$ kts. U 2
Experimental boat of small present day value

Mining Service.



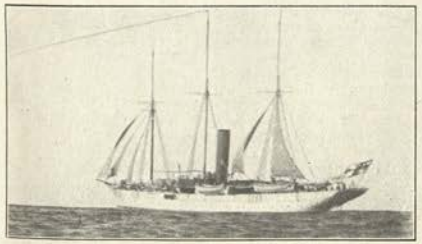
PELIKAN (1890). 2360 tons. Armament: 4—15½ pdr. H.P. 3000 = 15 kts. Coal: 410 tons.



RHEIN (1867). Mine school. 400 tons. Armament *nil*. Speed: 10 kts.

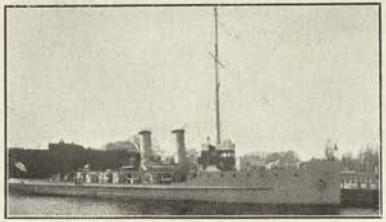
Note.—There are two special mine layers, *Albatross* and *Nautilus*. These are recorded on an earlier page.

Stationaire.

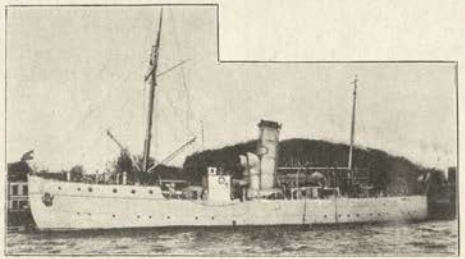


LORELEY (1884). 925 tons. Guns: 2—4 pdr. Speed, 12 kts.

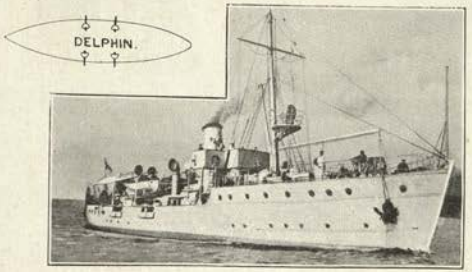
Special Service Tenders.



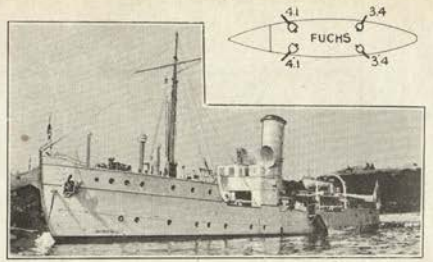
DRACHE (1908). 920 tons. Guns: 8—4·1 inch. Speed: 15 kts.



HAI (1907). 640 tons. Armament: 8— 4 pdr. Speed: 12 kts.

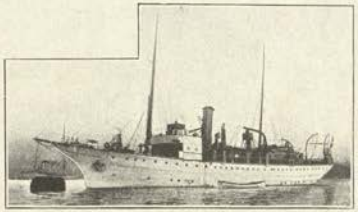


DELPHIN (1906). 450 tons. Armament: 4—24 pdr. Speed: 11 kts.



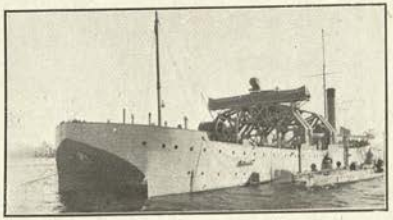
FUCHS (1905). 640 tons. Armament: 2—4·1 inch, 2—24 pdr. Speed: 12 kts.

Surveying.



PLANET (1905) & **MÖWE** (1906). 650 tons. Speed: 10 kts.

Special Submarine Ship.

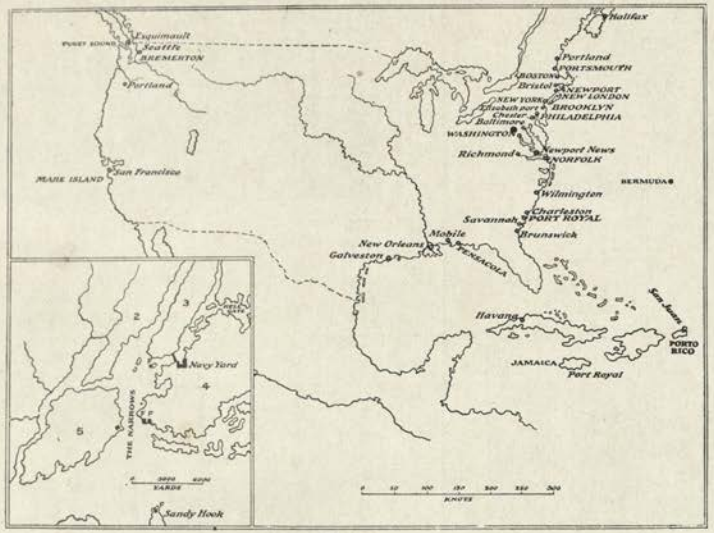


VULKAN (1908). Special dock, etc., ship. Speed: 11 kts.

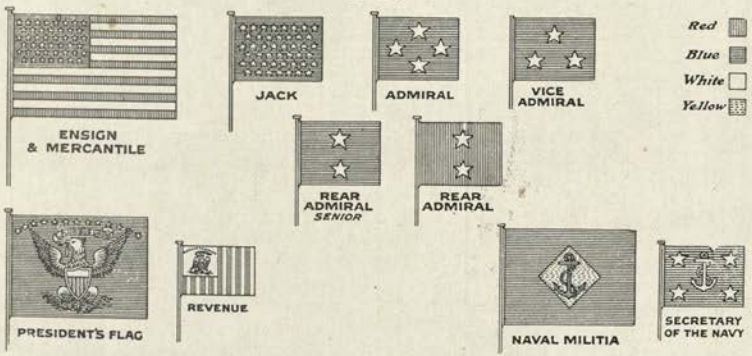
All photos made or collected by H. Reuterdahl, Associate U.S.N.I.

UNITED STATES FLEET.

(Officially revised 1913 by order of the Secretary of the Navy.)



FLAGS.



Senior officer when of or below rank of captain flies a blue triangular flag. Assistant Secretary of Navy has a flag same as Secretary's with colours reversed, *i.e.*, white ground and blue anchor and stars.

NEW YORK.

	to	knots
Bermuda		680
Boston (Mass.)		315
Brest		2954
Cherbourg		3066
Colon		1985
Galveston		1910
Gibraltar		3670
Havana		1320
Havre		3125
Jamaica		1495
Key West		1180
La Guayra		1840
Liverpool		3062
New Orleans		1710
Norfolk Navy Yard		300
Pernambuco		3690
Philadelphia (Pa.)		240
Portsmouth Navy Yard		330
Portsmouth (England)		3060
Wilhelmshaven		3570

KEY WEST

	to	knots.
Bermuda		1100
Boston (Mass.)		1387
Galveston		730
Jamaica (Port Royal Harbour)		850
New York		1180
Pensacola		235
Philadelphia		1020
Port Royal Naval Station		450
Portsmouth Navy Yard		1400

PORT ROYAL

	to	knots.
Bermuda		810
Key West		450
New York		650
Pensacola		785

MARE ISLAND

	to	knots.
Auckland (N. Zealand)		5965
Esquimault		750
Honolulu		2095
Kiao-chau		5600
Manila		7500
Panama		3424
Puget Sound		800
Yokosuka		4500

KAVITE.

	to	knots.
Amoy		700
Hong Kong		650
Kiao-chau		1325
Nagasaki		1300
Saigon		875
Singapore		1320
Vladivostock		2080
Yokosuka		1720
Hampton Roads		18,000

Uniforms.

Admiral of the Navy. | Rear-Admiral. | Captain. | Commander. | Lieut.-Commander. | Lieutenant. | Ensign.

Note.—Lieutenants, junior grade, have 1½ stripes. Chief Warrant officers one stripe broken with blue.

Line Warrant officers star without any stripe. Staff Warrant officers under Chiefs have no sleeve mark.

Engineers same as line officers (interchangeable).

Other branches than executive wear no sleeve star, but have distinctive colours between the sleeve stripes.

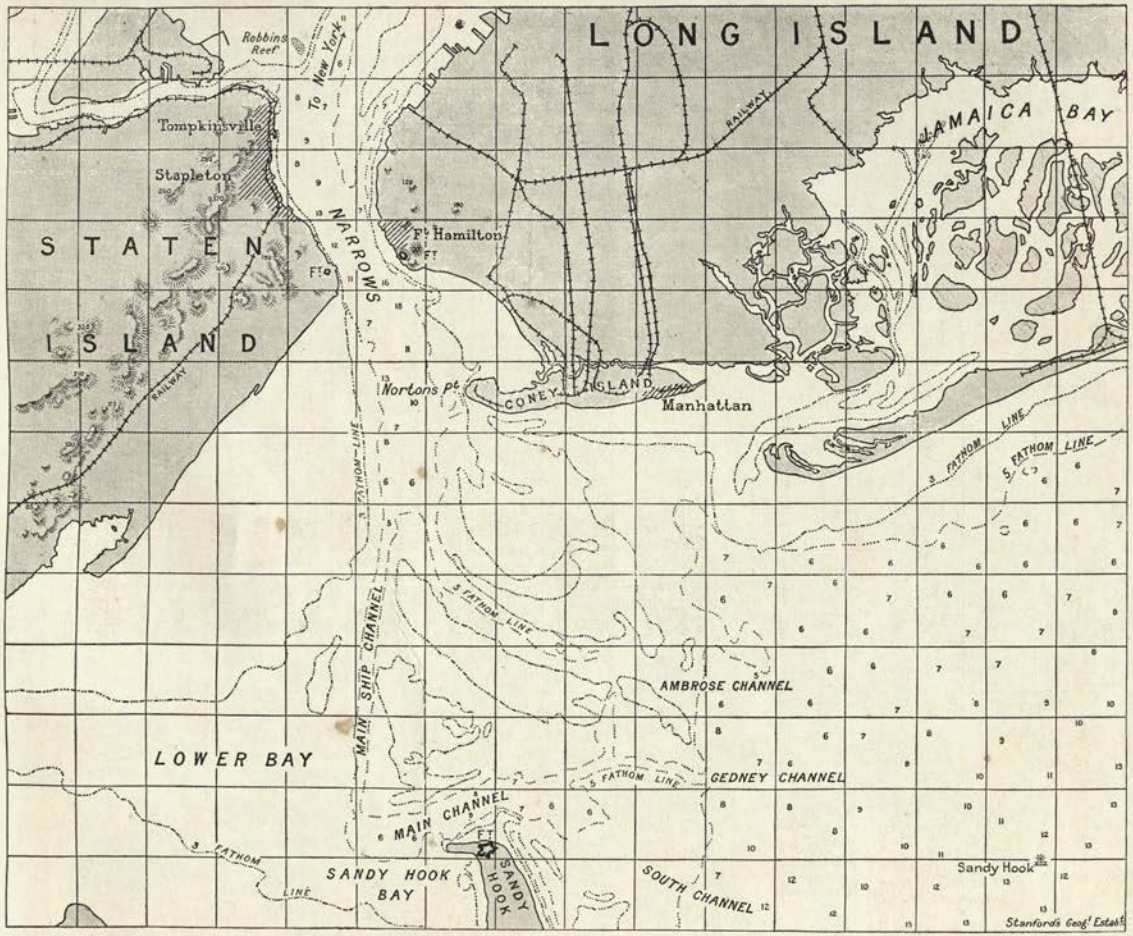
Colour of significance (between the sleeve stripes): *Medical*, dark maroon: *Pay*, white; *Constructors*, purple; *Civil Engineers*, light blue; *Professors of Mathematics*, olive green.

Mercantile Marine.

1725 steamers (2,603,602 tons net), 1865 sailing (1,291,480 tons net).

Coinage.

Dollar (100 cents)=approximately 4*s.* 2*d.* British.



Navy Yards.

1. **NEW YORK** (& **BROOKLYN**). Depôt and shipbuilding yard. Two slips.

   Dry docks:
   (1) granite, 338×98·4×24·5 feet.
   (2) concrete, 461×74×25·4 feet.
   (3) wood, 459×133×25·1 feet.
   (4) granite and concrete, 694·9×112×34·4 feet.

   Naval hospital here.

   Admiralty Chart No. 3204,2491.

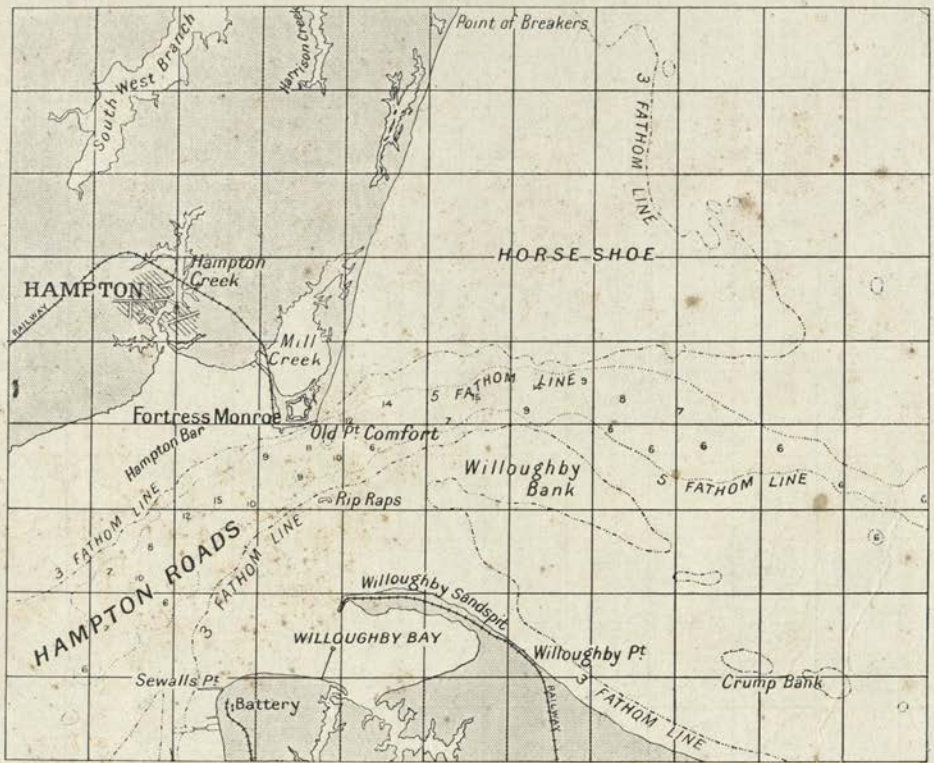
   Rise of Spring Tide, 4¾ feet.

   Founded 1801.

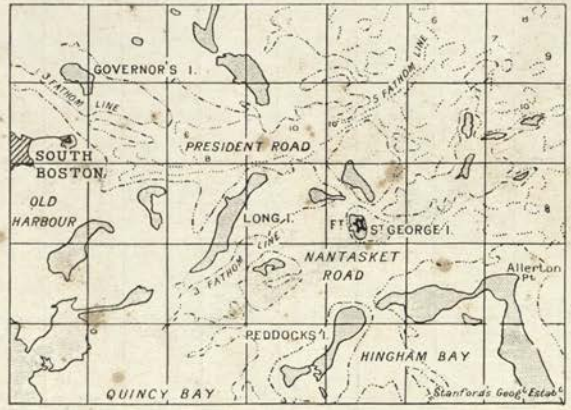
   Note.—Private docks. The Erie Co. has two timber docks: (1) 510×100×20 feet; (2) 620×85×25 feet. There are nineteen other small private docks in and about New York.

2. **NORFOLK,** VA. Depôt and shipbuilding yard. Naval hospital here. (1) Wood dock, $460 \times 97 \times 29\frac{3}{4}$ feet; (2) granite, $303 \times 60 \times 25\frac{1}{4}$ feet; (3) granite dock (new), $732 \times 98 \times 34$ feet.

Admiralty Chart No. 2818,2843a.



HAMPTON ROADS. Continuation northward of other chart.



Admiralty Chart No. 1227,2482. Rise of Spring Tide, 5 feet (Charlestown Naval Yard).

Navy Yards (East Coast).

3. **BOSTON,** Mass. Depôt. One granite dock, 389 × 46 × 26 feet; one granite and concrete dock, 729 × 82 × 30½ feet. Naval hospital here.

4. **LEAGUE ISLAND,** Philadelphia, Pa. Depôt. One wooden dock, 459 × 133 × 25½ feet; second dock granite and concrete, 725 × 107½ × 30 feet. Naval hospital here.

5. **WASHINGTON.** No docks. Yard devoted to ordnance construction. Naval hospital here.

6. **PORTSMOUTH,** N.H. One granite and concrete 725 × 196¾ × 30 feet. Naval hospital here.

7. **PENSACOLA,** Fla. 2nd class yard.

8. **CHARLESTON,** S.C. 2nd class Navy yard. Dry dock, 548 × 96 × 34¼ feet.

Portsmouth N.H.
Admiralty Chart No. 2482,2487.
Rise of Spring Tide, 8¼ feet.

Naval Stations.

NEWPORT, R.I. Chief torpedo station. Manufactory of torpedoes, etc. Naval war college and apprentice training station. Naval hospital.

KEY WEST. No docks. Small marine railway.

NEW ORLEANS, LA. Floating dock, 525 × 100 × 28¼ feet.

GUANTANAMO CUBA (*small repairs*).

Note.—Charleston, Guantanamo, Norfolk, and Bradford, R.I., are stations for petrol and oil fuel.

San Juan, Porto Rico.
Admiralty Chart No. 478,3408.
Rise of Spring Tide, 1 foot.

Principal Private Yards (East Coast).

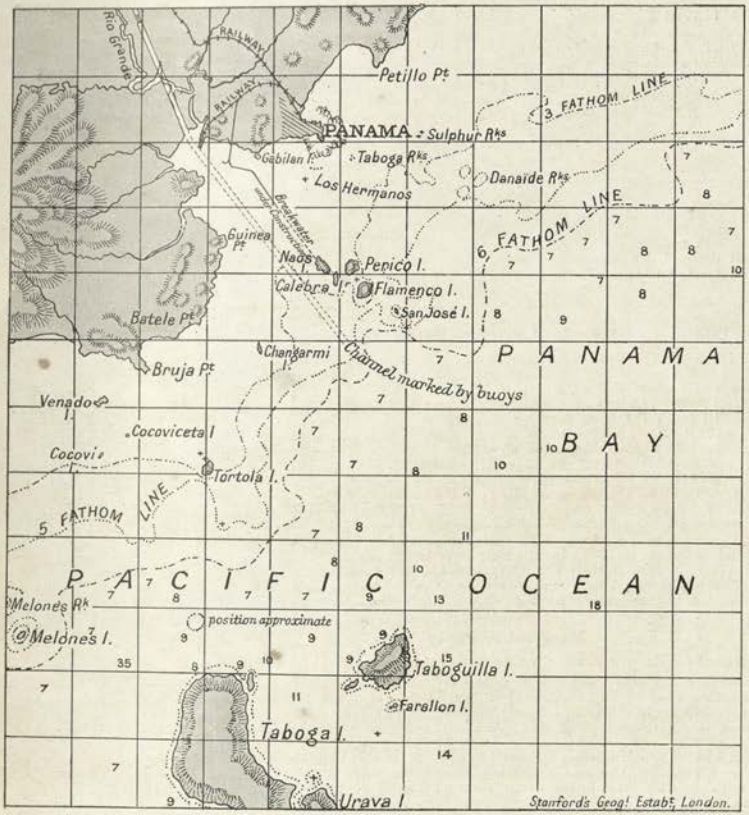
BATH IRONWORKS (Bath, Me.). One big slip.
CRAMPS (Philadelphia, Pa.). One dock, 432 × 56 × 22 feet. Marine railway, 300 feet long, 52 feet wide, capacity 2500 tons. One big slip.
CRESCENT SHIPYARD (Elizabethport, N.J.). One small dock.
ELECTRIC BOAT CO. (New York). "Hollands."
FORE RIVER ENGINE CO. (Quincy, Mass.). Nine big slips. Area, 40 acres. Depth of water at low tide, 25 feet. Employees, about 3500.
GAS ENGINE AND POWER CO. (Morris Heights, N.J.).
LAKE SUBMARINE BOAT CO. (Bridgeport, Con.). "Lakes."
MARYLAND STEEL CO. (Baltimore, Md.).
NEWPORT NEWS COMPANY. 100 acres. Deep water alongside. Water front, ½ mile. One 140-ton revolving derrick, one 100-ton sheer leg, one 50-ton floating derrick, one 10-ton ditto. Very large modern shops. Total employees *circa* 5000. Six big slips. Dry docks: (2) 804 × 80 × 30 feet; (3) 537½ × 79 × 24½ feet; (1) 593 × 50 × 24½ feet.
NEW YORK SHIPBUILDING CO. (Camden, N.J.). 156 acres. 4/5 mile water-front. About 5000 employees. 4 large slips, 8 smaller. Can build ships up to 1000 feet long. All machine tools and cranes electrically driven. Hydraulic and compressed air plant.

Mercantile Ports (East Coast).

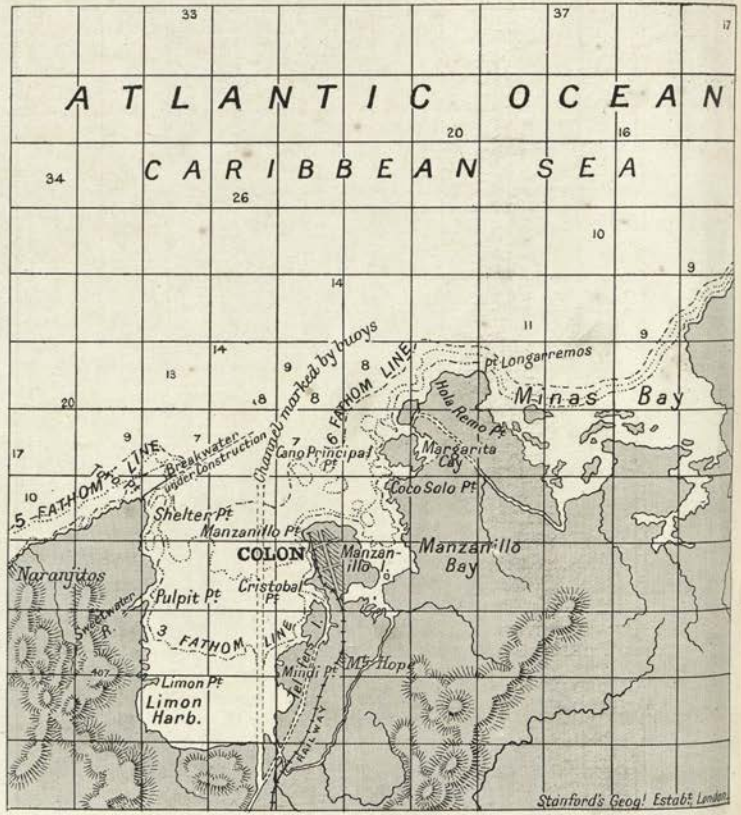
(In order of importance, with approximate tons of shipping cleared per year in brackets).

New York, N.Y. (13½ million); Boston, Mass. (1¾ million); Philadelphia, Pa. (2⅓ million); New Orleans (2¼ million); Baltimore, Md. (1¼ million); Galveston, Texas (1 million); Mobile, Ala. (¾ million); Hampton Roads, Va. (¾ million); Portland, Me. (½ million); Pensacola, Fla. (½ million); Savannah, Ga. (½ million); Key West (½ million); and lesser ports—Brunswick, Ga.; Charleston, S.C.

The bulk of vessels entering U.S. ports are British (nearly 21 million tons). Next in order: American (9¾ million), German (about 4 million) and Norwegian (about 2½ million). American trade is chiefly with Great Britain. Only about 8·7% of value of foreign trade is in American bottoms.

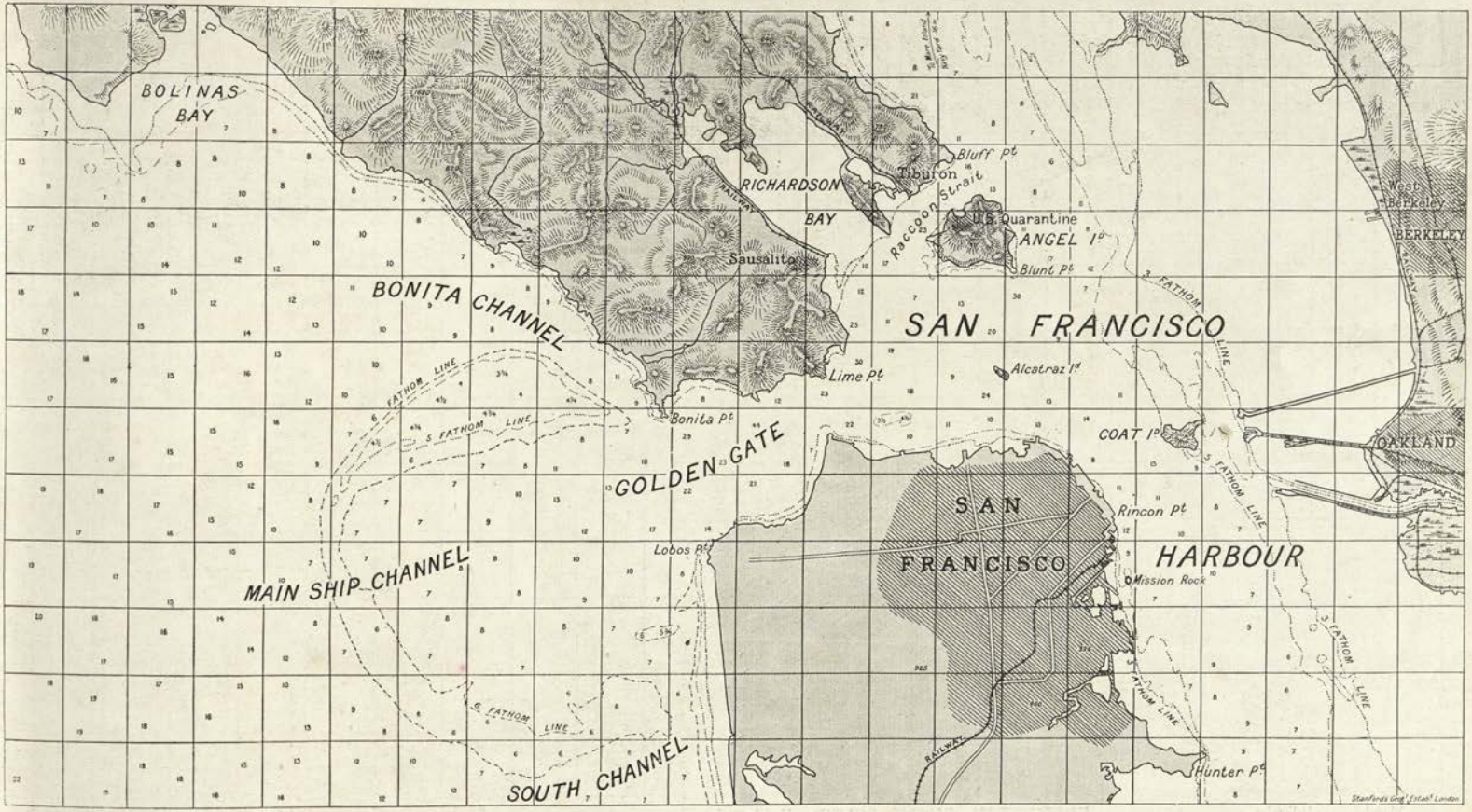


PACIFIC ENTRANCE TO PANAMA CANAL. Heavily fortified.



ATLANTIC ENTRANCE TO PANAMA CANAL. Heavily fortified.

Divided into 2000 yard squares. Uniform scale. Soundings in fathoms. Heights in feet.



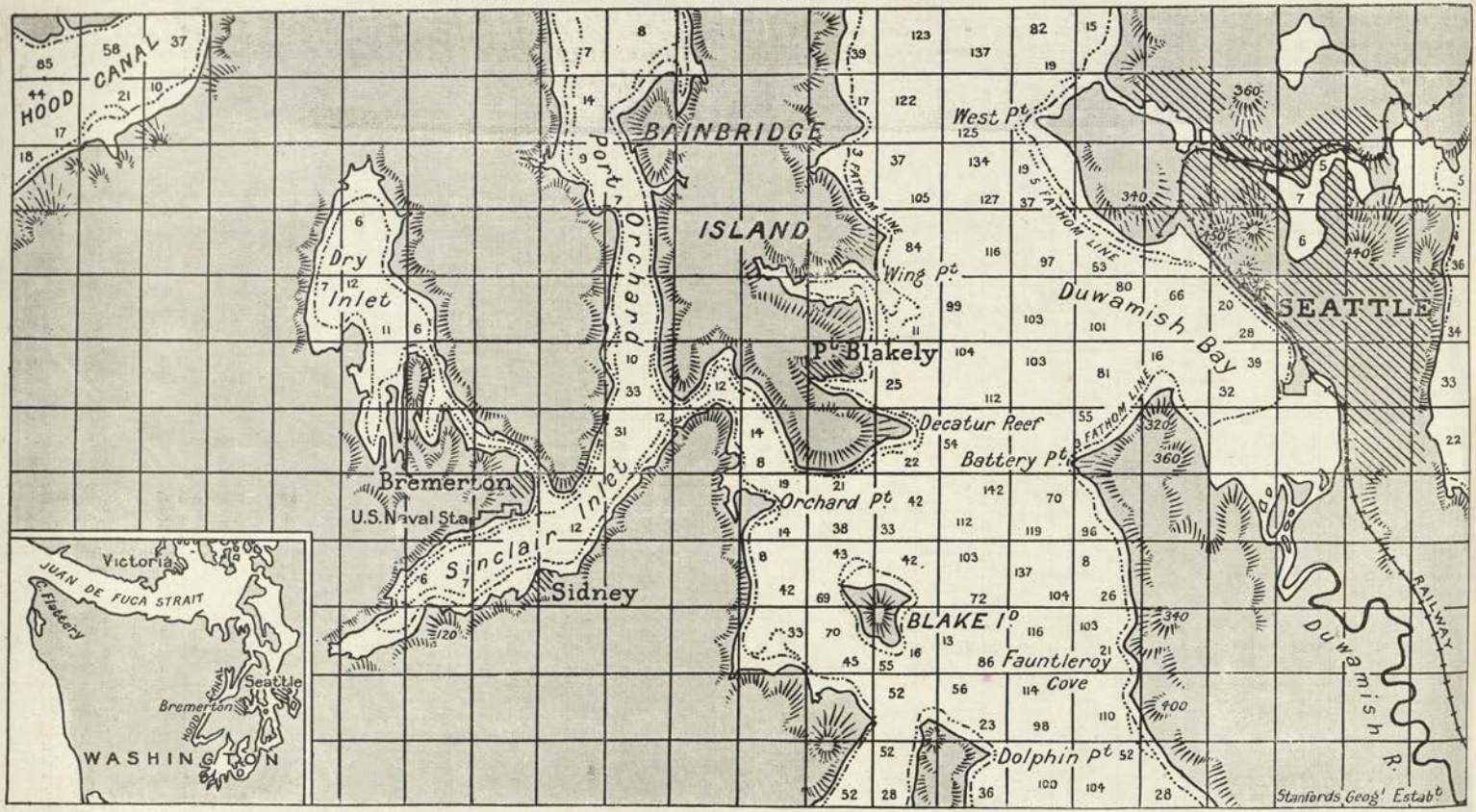
San Francisco Harbour. **MARE ISLAND.** Depôt and Navy Yard. (22 miles N. of San Francisco.)

Dry Docks:

(1) Granite ... $459\frac{1}{6} \times 96\frac{1}{6} \times 34\frac{1}{2}$ feet.
(2) Granite ... $730 \times 120 \times 30\frac{1}{4}$ „

U. S. PACIFIC COAST NAVY YARDS AND STATIONS.

Divided into 2000 yard squares. Uniform scale. Soundings in fathoms. Heights in feet.



Sketch map of district.

BREMERTON, PUGET SOUND. Naval Station.

Dry docks:

(1) Wood ... ... 618×73×27½ feet.
(2) Granite and concrete ... 801⅔×113×35¼ feet.

Naval Stations.—2ND CLASS, PACIFIC.

PEARL HARBOUR (HAWAII). (1) Honolulu. (2) Pearl Harbour. Large dock here. 800×114×34½ feet.

TUTUILA (SAMOA).

CAVITE (P.I.) Small dry dock at Manila.

OLONGAPO (P.I.) Floating dock, 18,500 tons, 500′ 0¾″ × 100′ × 70′ 0″.

Principal Private Yards.—PACIFIC COAST.

CRAIG SHIPBUILDING CO. (LONG BEACH, CAL.) Submarine builders.

MORAN & CO. (SEATTLE, PUGET SOUND). One big slip.

UNION IRONWORKS CO. (SAN FRANCISCO). 38 acres. Two dry docks (Hunters Point): (1) 750×103 feet (28,000 tons), (2) 485×97 feet (10,000 tons). Three small floating docks of 2500, 2000 and 1200 tons respectively. Six slips of 600 feet long, fully equipped with electric cranes, etc. Five wharves 585×50 feet, berthing for 15 average sized vessels. One sheer leg 100 tons, one 40 tons. All plant dates from 1910 or later. *Employees*: Average 2300.

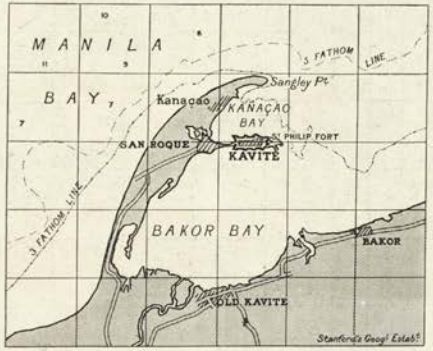
Mercantile Ports.

(With average tons of shipping cleared annually).

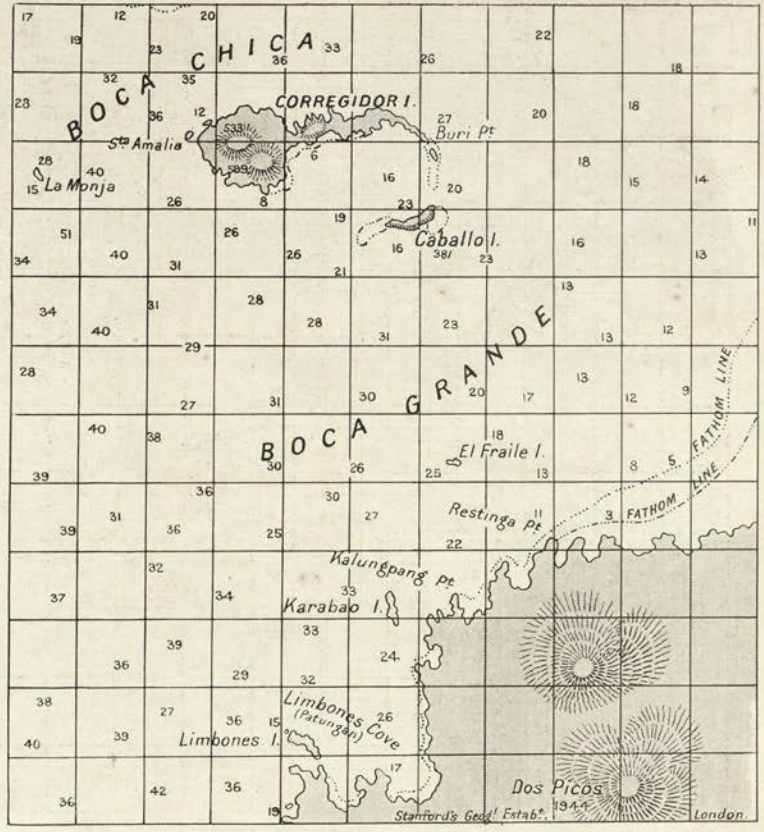
SEATTLE (2¼ million); SAN FRANCISCO (1¼ million *nearly*).

MARE ISLAND. Admiralty Chart No. 2887.

(See previous page.)

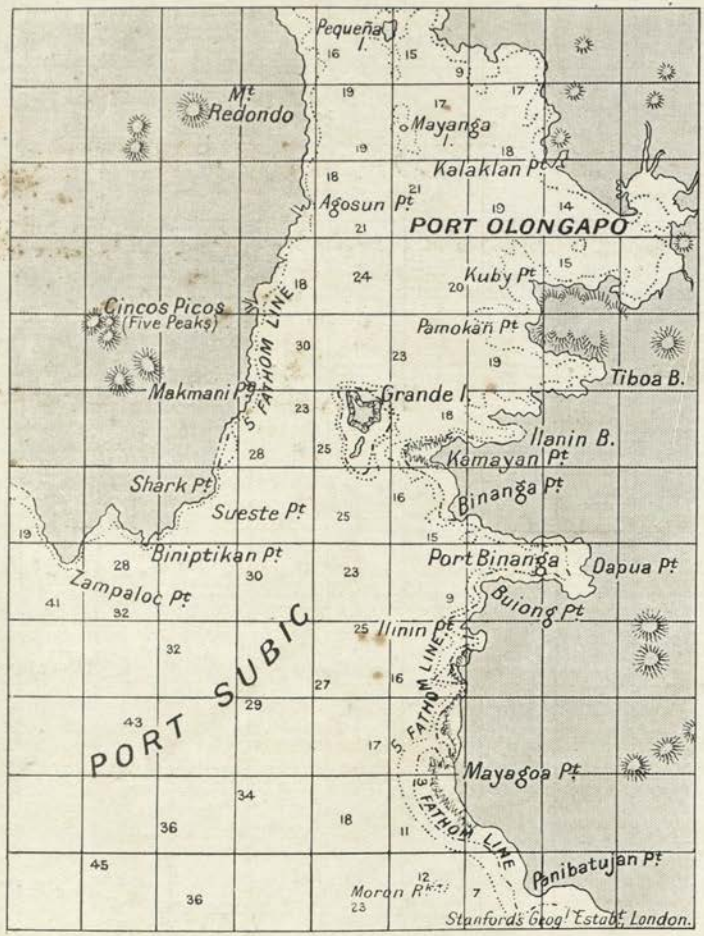


KAVITE P.I. Admiralty Chart No. 975,976.

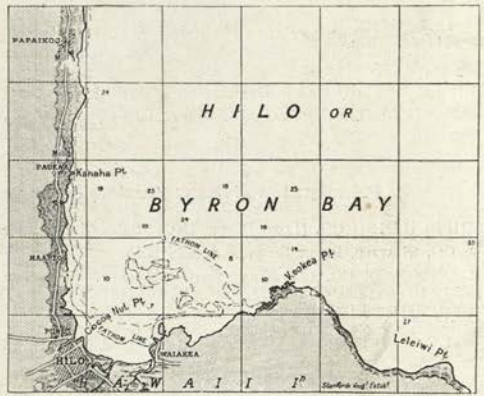


ENTRANCE TO MANILA BAY.

(Continued on next page.)



OLONGAPO & PORT SUBIC.



PEARL HARBOUR. Admiralty Chart No. 1510,1377.

TUTUILA (SAMOA).
Admiralty Chart No. 1730.

VESUVIUS (Experimental torpedo ship).

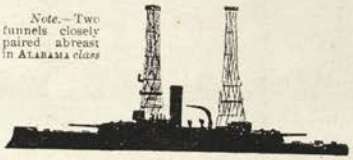
AB GLOUCESTER.

AG SCORPION & VIXEN.

AH SYLPH.

AI Presidential Yacht, MAYFLOWER.

Note.—Two funnels closely paired abreast in ALABAMA *class*



BG ALABAMA *class* (*page* 176) (3 ships).

CG DIXIE PRAIRIE, etc.

CH SUPPLY.

CH YORKTOWN.

CI CASTINE *class*.

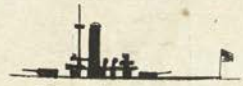
CJ MARIETTA *class*.

FO NEPTUNE (*collier*).

DA OZARK *class* (4 ships) (*page* 178).

DB AMPHITRITE.

DC TERROR.



DE MIANTONOMOH.

HARBOUR SERVICE (*page* 178).

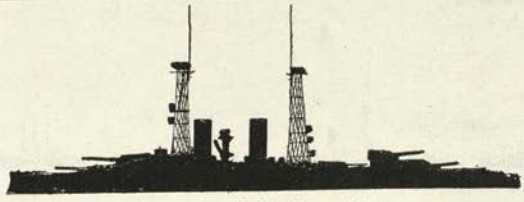
DF HELENA *class* (2 ships).

EA MONTEREY.

EB MONADNOCK.

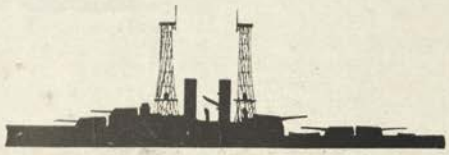
FN ANNAPOLIS *class*.

HARBOUR SERVICE (*page* 178).



F TEXAS *class* (2 ships) (*page* 166).

G ARKANSAS *class* (2 ships) (*page* 167).



H Utah *class* (*page* 168) (2 ships).

I S. Carolina *class* (*page* 170) (2 ships.)

K Delaware *class* (*page* 169) (2 ships).

HG Idaho *class* (*page* 172) (2 ships).

HI Indiana *class* (*page* 177) (3 ships).

HJ Iowa (*page* 177).

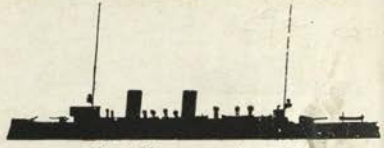
HL Kearsarge *class* (*page* 176 (2 ships).

IG Detroit *class*.

IH Nashville.

IJ Isla de Luzon.

IK Cincinnati (*page* 186).



JL Minneapolis (*page* 183).

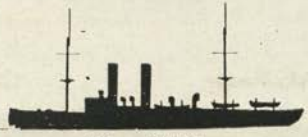
KG Chattanooga *class* (*page* 185) (6 ships).

KH Raleigh (*page* 186).

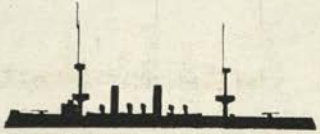
KI Olympia (*page* 183).

KL Baltimore.

LG Chicago.



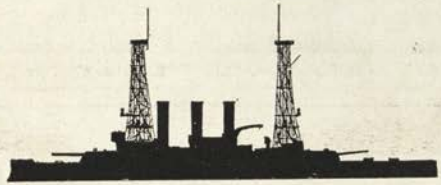
LH Newark.



LI Albany *class* (*page* 185) (2 ships).

LJ Paducah *class* (2 ships).

LK San Francisco



NG Maine *class* (3 ships) (*page* 175). **NH** Kansas *class* and Louisiana *class* (*pages* 171 and 173) (6 ships).

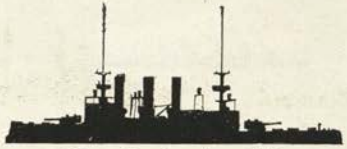
Note—Low freeboard aft. Ohio has shorter funnels than her sisters.

Funnels of New Hampshire.

To differentiate, note big turrets.

OG New Jersey *class* (*page* 174) (5 ships).

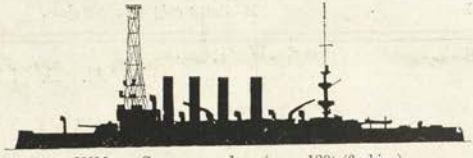
PG Brooklyn (*page* 182).



PH New York (*page* 182).

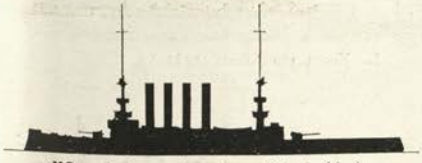
VG Columbia (*page* 183).

Same general appearance as *California* class.
Washington has not yet had a cage mast fitted.
Montana and *N. Carolina* funnel casings low, like *New Hampshire*.



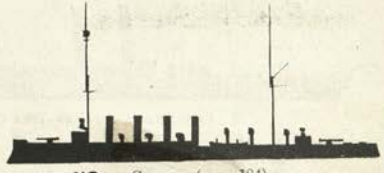
WG Washington *class* (*page* 179).

WH California *class* (*page* 180) (6 ships).
There are minor differences in this class (see page 179.)



XG St. Louis *class* (*page* 181) (3 ships).

YG Salem & Birmingham (*page* 184)

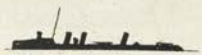


YG Chester (*page* 184).

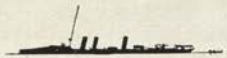
H 3rd class t. b. **I** Somers t. b.

J Farragut & Goldsborough t. b. **K** Barney *class.* 3 t. b. **L** Rogers *class.* 3 t. b. **M** Dahlgren *class.* 2 t. b. **N** Morris t. b. and 2nd class t. b.

O Stringham t. b.



P Shubrick *class.* 7 t. b.

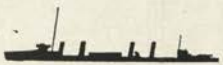


R Porter t. b.

G Roe t.b.d.

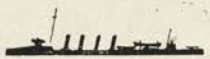
Z Bailey.

S Whipple.



W Truxton & Worden.

V Hull *class* (2).



Y Lawrence *class* (2).

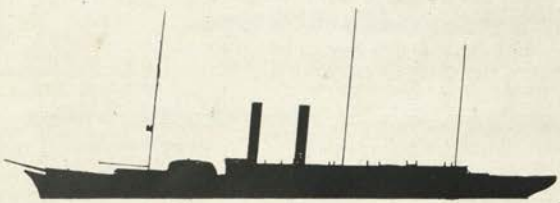
B Smith *class* t.b.d.

B Smith *only* of Smith *class.*

C Paulding & Ammen *class* t.b.d.

X Bainbridge *class* (9).

U. S. LINERS of 18 kts. or over. **UM** cone.



J Philadelphia and New York (20 kts.)

K St. Louis and St. Paul (19 kts.)

L Korea and Siberia (18 kts.)

U. S. FLEET.

Oversea Possessions: Philippines, Hawaian Islands, Hilo, Tutuila (Pearl Harbour, Samoa), Porto Rico, Guam.
Personnel: 60,217 all ranks (including about 10,000 marines).
Secretary of the Navy: J. Daniels. *Chief Constructor*: Richard M. Watt.
Colour of ships: Steel grey, including all except Naval Militia ships, gunboats and yachts white with yellow upper works. Navy tugs: black with yellow upper works.

Principal Guns in the U. S. Fleet.

(Corrected from the latest official figures.)

Notation.	Nominal Calibre.	Mark or Model.	Length in Calibres.	Weight of Gun.	Weight of A.P. Shot.	*Service* Initial Velocity.	*Maximum* penetration firing *capped* A.P. direct impact against K.C. armour.			Approximate Danger Space average ship, at			Muzzle Energy
							9000	6000	3000	10,000	5000	3000	
	inch.			tons.	lbs.	ft. secs.	in.	in.	in.	yards.	yards.	yards.	
A7	14	...	45	63	1400	2600	...	...	...	...	...	...	...
A3	13	I. & II	35	61½	1130	2000	8	9¾	12	110	310	550	31,333
A6	12	VII	50	56·1	870	2950	11·0	13·9	17·5	...	...	...	52,483
A6	12	VI	45	53·6	870	2850	10·6	13·3	16·6	...	...	...	48,984
A5	12	V	45	52·9	870	2700	9·8	12·3	15·5	..	...	...	43,964
A4	12	III & IV	40	52·1	870	2600	9·3	11·7	14·8	...	...	...	40,768
A3	12	III & IV	40	52·1	870	2400	8·3	10·5	13·3	39†	126	264	34,738
A2	12	I & II	35	45·3	870	2100	7·2	8·8	11·2	100	390	580	26,596
A2	10	III	40	34·6	510	2700	6·9	9·0	11·9	140	460	700	25,772
...	10	I & II	30	25·1	510	2000	5·0	6·1	8·0	...	...	...	14,141
A	8	VI	45	18·7	260	2750	4·4	6·1	8·6	45†	...	...	13,630
B	8	V	40	18·1	260	2500	4·0	5·3	7·5	45	...	...	11,264
C	8	III & IV	35	13·1	260	2100	3·6	4·2	6·0	...	...	...	7,948
C	7	II	45	12·7	165	2700	3·0	4·2	6·4	95	385	580	8,338
C	6	VIII	50	8·6	105	2800	2·3	3·2	5·2	...	...	...	5,707
D	6	VI	50	8·3	105	2600	2·2	2·9	4·7	75	250	470	4,920
*D**	6	IX	45	7·0	105	2250	2·1	2·5	3·8	...	...	..	3,685
*E**	6	IV, VII	40	6·0	105	2150	2·1	2·4	3·6	35	150	355	3,365
*E**	5	VII	51	5·0	50	3150	1·4	1·8	3·4	...	...	...	3,439
	5	VI	50	4·6	50	3000	1·4	1·7	3·2	...	...	...	3,122
	5	V & VI	50	4·6	60	2700	1·6	2·0	3·5	...	...	...	3,032
*F**	5	II, III, IV	40	3·1	50	2300	1·4	1·7	2·6	...	...	...	1,834
*F**	4	VIII	50	2·9	33	2800	1·2	1·5	2·6	...	...	...	1,794
*F**	4	VII	50	2·6	33	2500	1·2	1·4	2·2	...	..	...	1,430
*F**	4	III, IV, V, VI	40	1·5	33	2000	...	1·2	1·7	...	..	..	915
F	3	V, VI, *S-A*	50	1·0	13	2700	...	0·8	1·2	...	...	...	658
*F**	3	II, III	50	0·9	13	2700	...	0·8	1·2	...	...	...	658

* = Brass cartridge case. † = Calculated for a 20 ft. target.
Guns of 1899 and later have Vickers breech, etc. All guns use nitro-cellulose.

14 inch, 45 cal. mounted in *Texas* (2). *Oklahama* (2), & *Pennsylvania* (2) classes.
12 inch, 50 cal. „ in *Arkansas* (2), and *Utah* (2) classes.
12 inch, 45 cal. „ *Delaware* (2) *Idaho* (2), *Louisiana* (2), *Kansas* (4), and *S. Carolina* (2) classes.
12 inch, 40 cal. „ *Maine* (3), *New Jersey* (5), and *Ozark* (4) classes.
12 inch, 35 cal. „ *Iowa*.

Torpedoes.

Size.	Name or Mark.	Air Pressure.	Charge.	*Max.* Range.	Average speed if set for		
					1000	2000	4000
inches.		lbs.	lbs.	yds.	kts.	kts.	kts.
21	Bliss Leavitt M. '05		300	4000	36	33	27
18	Bliss Leavitt M. '05		200	4000	36	33	27
18	Whitehead long II	2000	200	2000	28	22	
	„ „ I	1850	200	2000	26	20	
18	Whitehead short	1850	200		26	19	

Also the latest model 21 inch Whitehead for new ships.

Funnel Marking System

Battle Fleet.

FORE FUNNEL:

Ships in 1st division, one band.
„ 2nd „ two bands.
„ 3rd „ three „
„ 4th „ four „

SECOND FUNNEL:

Bands to indicate position of ship in its division.
All bands are black.

Armoured Cruisers.

Armoured cruisers on Atlantic coast have same markings as Battle Fleet; on Pacific coast, white bands instead of black.

x 2

1913 U. S. DREADNOUGHTS. Nos. 14 & 13

(Pennsylvania Class.)

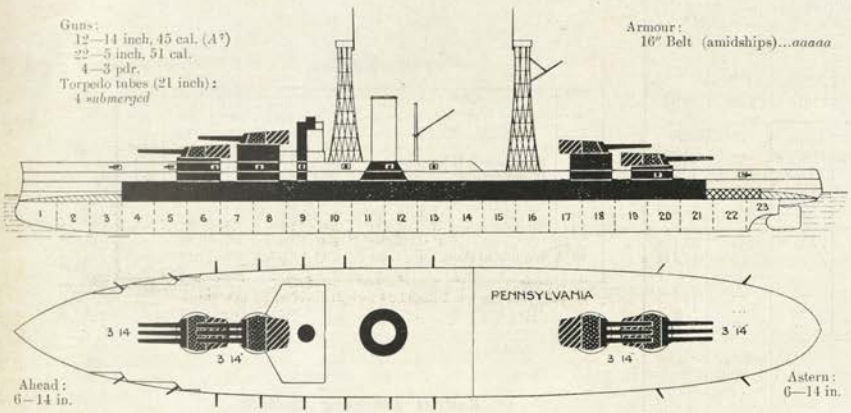
PENNSYLVANIA (building) & NORTH CAROLINA (building.)

Normal displacement, 31,400 tons. *Full load,* tons. Complement,

Length (*waterline*), 600 feet. Beam, 97 feet. *Mean* draught, 28½ feet. Length *over all*, 680 feet (*p.p.* 596 ft.)

Guns:
12—14 inch, 45 cal. (A?)
22—5 inch, 51 cal.
4—3 pdr.
Torpedo tubes (21 inch):
4 *submerged*

Armour:
16″ Belt (amidships)...*aaaaa*



Ahead:
6—14 in.

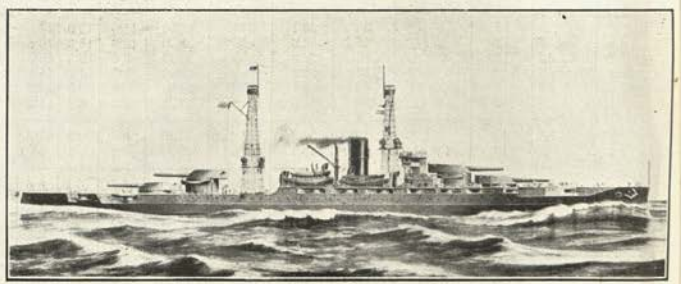
Astern:
6—14 in.

Broadside: 12—14 in.

Machinery: *Pennsylvania*, Curtis turbines. *North Carolina*, Parsons turbines. Boilers: Designed H.P. 31,500 = 21 kts. Fuel: oil only.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
				To be			
Pennsylvania	Newport News		Feb.'13	Feb.'16			
North Carolina	New York Yard		July,'13	July'16			

General Notes. – *P.* authorised 1912-13, the other 1913-14.



Official Sketch. Pennsylvania.

1912 U. S. DREADNOUGHTS. 12 & 11

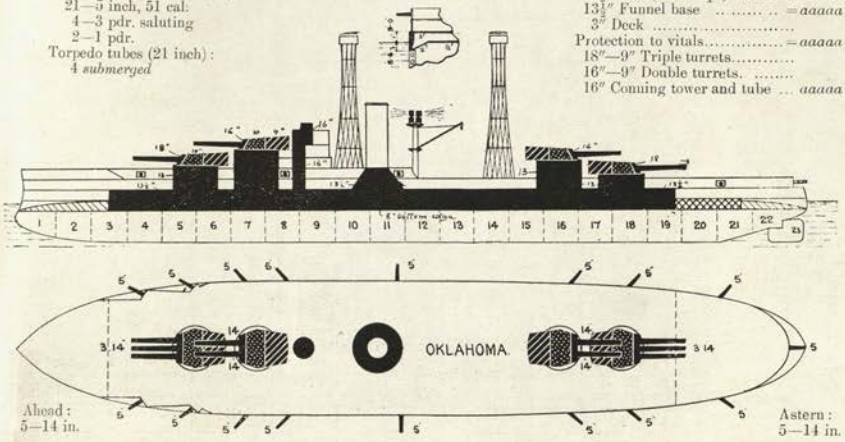
OKLAHOMA (1914) & *NEVADA* (1914).

Normal displacement, 27,500 tons. *Full load*, 28,400 tons. Complement, 863.

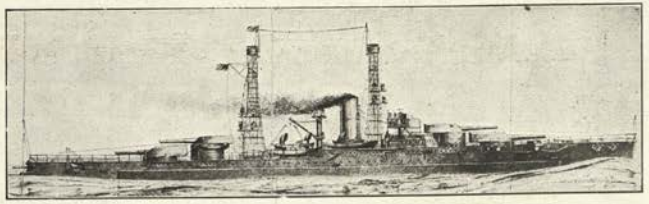
Length (*waterline*), 575 feet. Beam, 95¼ feet. *Mean* draught, 28½ feet. Length *over all*, 583 feet.

Guns:
10—14 inch, 45 cal. (*A*[7])
21—5 inch, 51 cal.
4—3 pdr. saluting
2—1 pdr.
Torpedo tubes (21 inch):
4 *submerged*

Armour:
13½″ Belt (amidships) ..... *aaaa*
13½″ Funnel base ..... =*aaaaa*
3″ Deck .....
Protection to vitals..... =*aaaaa*
18″—9″ Triple turrets.....
16″—9″ Double turrets. .....
16″ Conning tower and tube ... *aaaaa*



Broadside: 10–14 in.



Official Sketch. OKLAHOMA.

Machinery: *Oklahoma*, Triple expansion; *Nevada*, Curtis Turbines. Boilers: *O*, 12 Babcock; *N*, 12 Yarrow. Designed H.P. 24,800=20·5 kts. Coal: none. Oil, 598,400 gallons (2000 tons), *maximum capacity*.

Armour Notes.—Main belt is 17½ feet wide; 8½ feet of it being below *Lwl.* Lower edge is 8″. The ends are unarmoured, the battery also. The ships mark a new era in naval construction, being the first to embody the "everything or nothing" idea in the matter of protection.

Gunnery Notes.—Guns in the triple turrets in one sleeve, can be fired as one piece.

Engineering Notes.—Cylinders of *Oklahoma* are H.P. 35″, I.P. 59″, L.P. (2) 78″. Stroke, 48″. Total heating surface, 48,000 sq. feet. Weight of machinery, 1900 tons. Electric installation in both is 4 generating sets of 300 k.w., 125 volts, 2400 amp. each. 16 searchlights.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Oklahoma	N. York Shipb'g	N.Y. Shipb'ld'g	Oct. '12	Jan.'15.		Babcock	
Nevada	Fore River Co.	Fore River	Nov.'12	Jan.'15		Yarrow	

TEXAS CLASS—2 SHIPS.

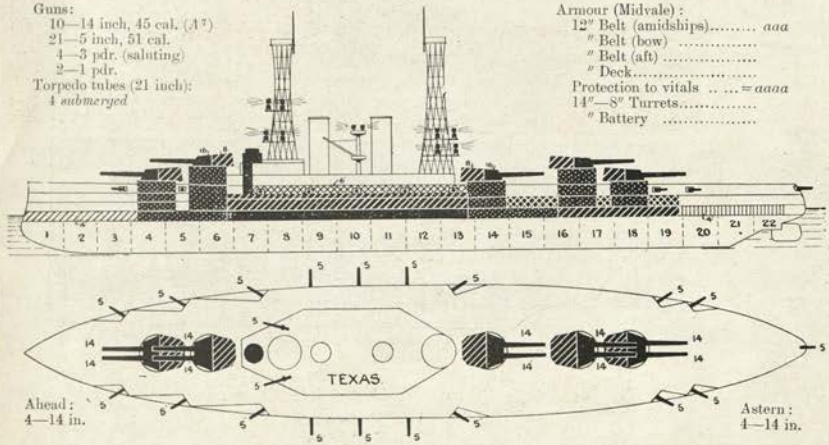
NEW YORK (Oct., 1912) & TEXAS (May, 1912).

Normal displacement, 27,000 tons. *Full load*, 28,367 tons. Complement, 1015 (as flagship, 1070).

Length (*waterline*), 565 feet. Beam 95¼ feet. *Mean* draught, 28½ feet.

Guns:
10—14 inch, 45 cal. (A[1])
21—5 inch, 51 cal.
4—3 pdr. (saluting)
2—1 pdr.
Torpedo tubes (21 inch):
4 *submerged*

Armour (Midvale):
12" Belt (amidships)..... *aaa*
" Belt (bow) .....
" Belt (aft) .....
" Deck.....
Protection to vitals .. ...=*aaaa*
14"—8" Turrets.....
" Battery .....



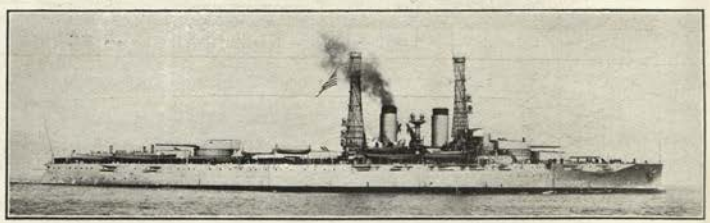
Broadside: 10—14 in.

Machinery: Vertical triple expansion, 4 cylinder. 2 screws. Boilers: 14 Babcock (8 with superheaters). Designed H.P. 28,100=21 kts. Coal: *normal* tons; *maximum* 2850 tons. Oil: 124 tons.

Engineering Notes.—Cylinders: H.P. 39", I.P. 63", L.P. (2) 83. Stroke: 48". Grate area: 1554 sq. feet. Heating surface: 62,215+3267 sq. feet. Weight of machinery: 2375 tons. Electrical installation: 4 sets each of 300 k.w., 125 volts, 2400 amps., by General Electric Co.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials: maximum*	*mile*	*mean*	*Boilers*	*Best recent speed*
Texas	Newport News	Newport News	Apl. '11	Dec. '13		=	21,128	Babcock	22
New York	New York Yard	Cramp	Sept. '11	May '14		=	...	Babcock	...

General Notes.—Authorised 1910. Both ships fitted as flagships.



Photo, Müller.

1910 U. S. DREADNOUGHTS Nos. 8 & 7

(Arkansas Class—2 Ships.)

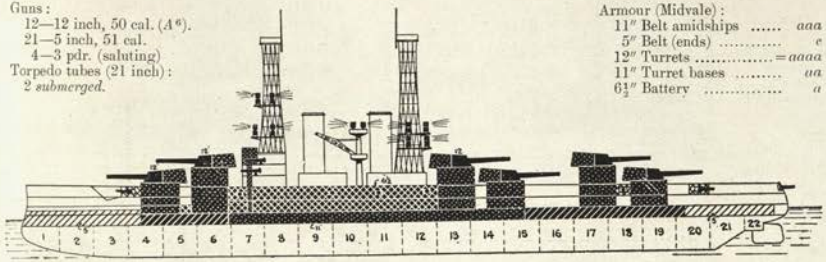
ARKANSAS (Jan., 1911), & **WYOMING** (May, 1911).

Normal displacement, 26,000 tons. *Full load*, 27,243 tons. Complement, 1036 (as flagship, 1091).

Length (*waterline*), 554 feet. Beam, 93¼ feet. *Mean* draught, 28½ feet. Length *over all*, 562 feet.

Guns:
12—12 inch, 50 cal. (A^6).
21—5 inch, 51 cal.
4—3 pdr. (saluting)
Torpedo tubes (21 inch):
2 *submerged*.

Armour (Midvale):
11″ Belt amidships ..... *aaa*
5″ Belt (ends) ..... *c*
12″ Turrets ..... = *aaaa*
11″ Turret bases ..... *aa*
6½″ Battery ..... *a*



Ahead:
4—12 in.
6—5 in.

Astern:
4—12 in.
6—5 in.

Broadside: 12—12 in., 11—5 in.

Machinery: Parsons turbine. 4 screws. Boilers: 12 Babcock. Designed H.P. 28,000 = 20·5 kts.
Coal: *normal* 1669 tons; *maximum* 2500 tons. Oil, 400 tons.

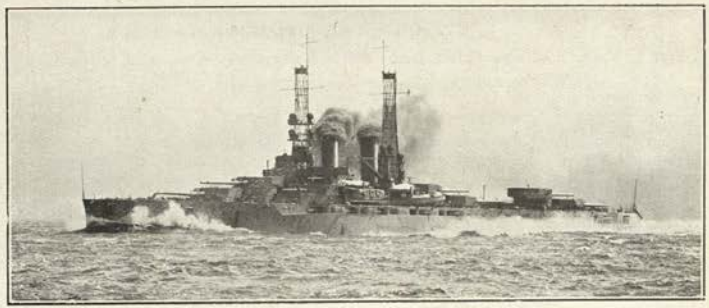
Gunnery Notes.—Height of guns above water: No. 1 turret, 28½ feet; No. 2, 36½ feet; No. 3, 33 feet; No. 4, 25 feet; No. 5, 31½ feet; No. 6, 23½ feet.
Arcs of training: (1) 300°, (2) 270°, (3) 280°, (4) 260°, (5) 330°, (6) 300°.

Armour Notes.—Main belt 400 feet long, goes 6 feet below l.w.l.

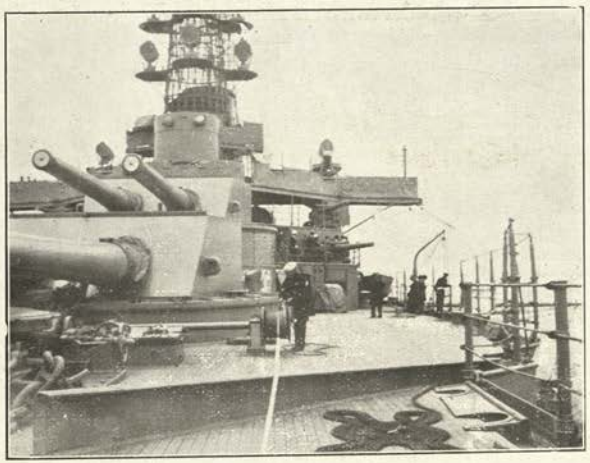
Engineering Notes.—Approximately 148 r.p.m. = 10·5 kts., 215 = 15 kts., 300 = 20 kts., 320 = 22 kts. Grate area: 1428 sq. feet. Heating surface: 64,234 sq. feet. Weight of machinery: 2177 tons. Electrical installation: 4 sets each 300 k.w., 125 volts, 2400 amps., by General Electric Co. Searchlights: 16.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials (mean)* 24 *hrs. at* 19	4 *hrs. f.p.*	*Boilers*	*Best recent speed*
Arkansas	N.Y.Shipbld. Co	N.Y. Shipbld. Co.	Jan.,'10	Sept.,'12	—	28,697 = 21·05	Babcock	21·15
Wyoming	Cramp	Cramp	Feb.,'10	Sept.,'12	20,784 = 19·21	31,601 = 21·22	Babcock	22·45

General Notes.—Authorised 1909. Contracts awarded Sept. & Oct., 1909. Both fitted as flagships. Freeboard: Forward, 25′; amidships, 19′ 2″; at No. 6 turret, 18′; at stern, 16′ 3″.



Wyoming. *Photo by favour of H. Reuterdahl, Esq.*



Fore Turrets, Etc., Arkansas. *Photo, H. Reuterdahl, Esq.*

1909 U. S. DREADNOUGHTS Nos. 6 & 5

(Utah Class—2 Ships.)

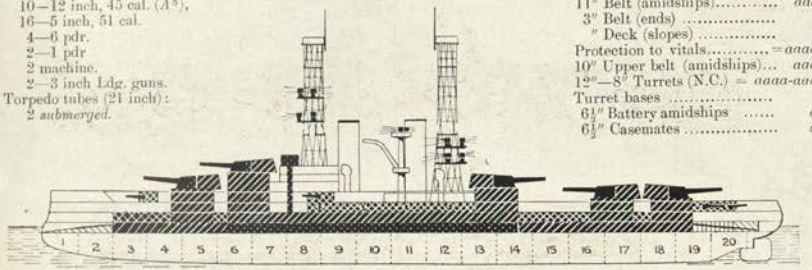
UTAH (Dec. 1909), & **FLORIDA** (May, 1910).

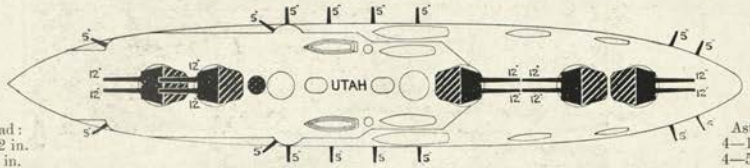
Normal displacement 21,825 tons. *Full load*, 23,033 tons. Complement, 940 (as flagship, 995).

Length (*waterline*), 510 feet. Beam, 88¼ feet. *Mean* draught, 28½ feet. Length *over all*, 521½ feet.

Guns:
10—12 inch, 45 cal. (*A*[3]),
16—5 inch, 51 cal.
4—6 pdr.
2—1 pdr
2 machine.
2—3 inch Ldg. guns.
Torpedo tubes (21 inch):
2 *submerged*.

Armour (Midvale):
11″ Belt (amidships)..... *aaa*
3″ Belt (ends) ..... *e*
″ Deck (slopes) .....
Protection to vitals..... = *aaaa*
10″ Upper belt (amidships)... *aaa*
12″—8″ Turrets (N.C.) = *aaaa-aaa*
Turret bases .....
6½″ Battery amidships ..... *a*
6½″ Casemates ..... *a*




UTAH
5' 5' 5'

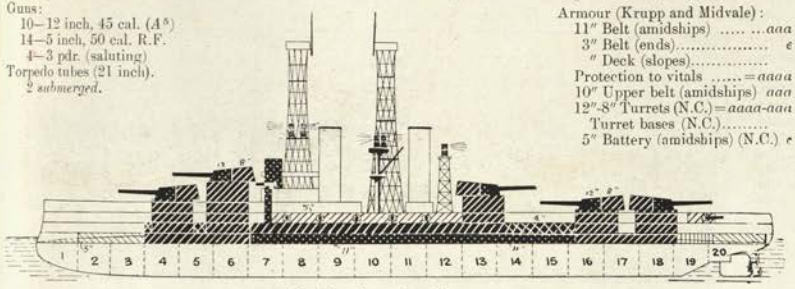
(Delaware Class—2 Ships).

DELAWARE (February, 1909), & **NORTH DAKOTA** (November, 1908).

Normal displacement, 20,000 tons. Full load, 22,060 tons. Complement, 937.
Length (*waterline*), 510 feet. Beam, 85¼ feet. *Mean* draught, 27 feet. Length *over all*, 518¾ feet.

Guns:
10—12 inch, 45 cal. (*A*[5])
14—5 inch, 50 cal. R.F.
4—3 pdr. (saluting)
Torpedo tubes (21 inch).
2 submerged.

Armour (Krupp and Midvale):
11″ Belt (amidships) ....*aaa*
3″ Belt (ends)..... *e*
″ Deck (slopes).....
Protection to vitals .....=*aaaa*
10″ Upper belt (amidships) *aaa*
12″-8″ Turrets (N.C.)=*aaaa-aaa*
Turret bases (N.C.).....
5″ Battery (amidships) (N.C.) *e*


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
DELAWARE.
12 12
5 5 5

1906 U. S. DREADNOUGHTS. Nos. 1 & 2

(S. Carolina Class—2 Ships).

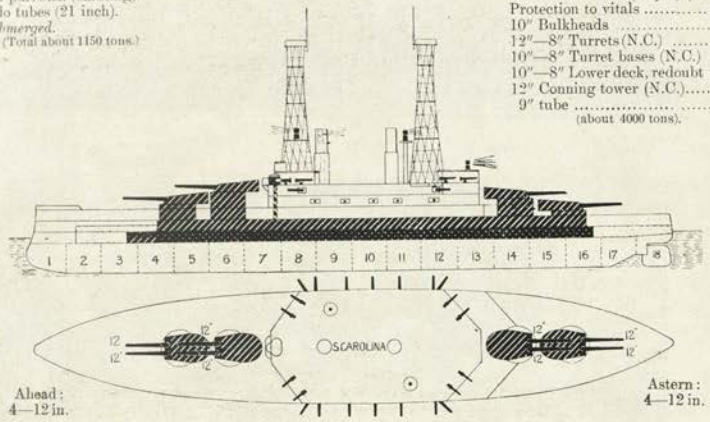
SOUTH CAROLINA (1908), & MICHIGAN (May, 1908).

Normal displacement, 16,000 tons. *Full load* displacement, 17,617 tons. Complement, 805.

Length (*waterline*), 450 feet. Beam, 80¼ feet. *Mean* draught, 24½ feet. Length *over all*, 452¾ feet.

Guns:
8—12 inch, 45 cal. (A^5).
22—3 inch, 14 pdr.
2—3 pdr. S.A. (saluting)
Torpedo tubes (21 inch).
2 *submerged*.
(Total about 1150 tons.)

Armour (*S.C.* Krupp; *M.* Midvale):
11″–9″ Belt (amidships)..... *aaa-aa*
11½″ Belt (ends) ..... *f*
3″ Armour deck (slopes) (*see notes*).
Protection to vitals ..... = *aaaa*
10″ Bulkheads ..... *aaa*
12″—8″ Turrets (N.C.) ..... *aaa-a*
10″—8″ Turret bases (N.C.) ..... *aa*
10″—8″ Lower deck, redoubt *aaa-aa*
12″ Conning tower (N.C.)..... *aaa*
9″ tube ..... *aa*
(about 4000 tons).



Ahead: 4—12 in.

Astern: 4—12 in.

Broadside: 8—12 in.

Machinery: 2 sets vertical 4 cylinder triple expansion. 2 screws (outward turning). Boilers: 12 Babcock (1906 model) in 3 compartments. Designed H.P. 16,500 = 18.5 kts. Coal: *normal* 900 tons; *maximum* 2380 tons.

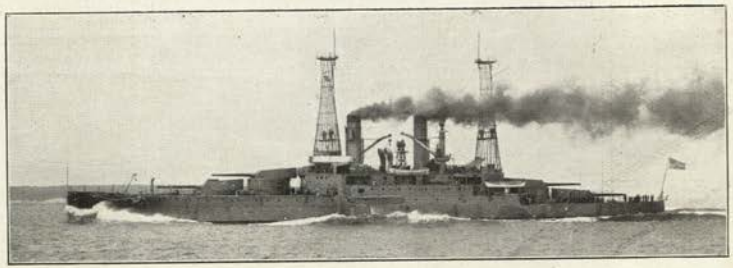
Armour Notes.—Main belt, 8 feet wide; 6¾ feet of it below waterline; top and bottom, 9″; waterline, 11″–10½″. Redoubt belt 8″ at upper edge, 10″ lower. Low turrets with small bases. Fronts of turrets, 12″; sides, 8″. Redoubt, 300 ft. long. Armour deck forward and amidships is 1½″ on slopes, aft it is 3″.

Gunnery Notes.—Mustin sights. Hoists, electric. Big guns manœuvred electrically. Arcs of fire, 270° each turret. Fore turret guns 24 ft. above water, "after fore turret" guns 32 feet. Barbette of this rises 12 feet above the deck. Twelve hoists for 3 inch guns.

Engineering Notes.—Pressure, 265 lbs. Revolutions full power = 121. Machinery, etc., weighs 1555 tons. Grate area, 1050 sq. feet. Heating surface, 47,220 sq. feet.

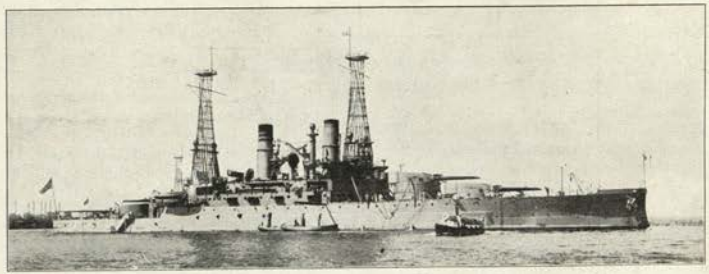
Name	*Builder*	*Laid down*	*Completed*	*Trials (mean)*	*Boilers*	*Best recent speed*
S. Carolina	Cramp	Nov., '06	Dec., '09	17,882 = 18·86	Babcock	19·68
Michigan	N.Y. Ship Bldg. Co.	Dec., '06	Aug., '09	13,253 = 17·95 16,313 = 18·79	Babcock	20·01

General Notes.—Authorised 1905. These ships, though laid down after, were projected *before* the British *Dreadnought*: and so may be considered as the first "Dreadnoughts" (*i.e.* all big gun ships). They are good sea boats but roll heavily.



South Carolina

Photo by favour of Collier's Weekly. Copyright, Stebbins.



Michigan

Differences.—*Michigan* carries steam launch athwartships abaft after funnel. *S.C.* has emergency cabin in base of main mast, *M.* has not. Both have old type platforms to masts.

1904 U. S. BATTLESHIPS (18 knot). *First line.*

(Kansas Class—4 Ships).

KANSAS (Sept., 1905), **VERMONT** (Aug., 1905), **MINNESOTA** (April, 1905), & **NEW HAMPSHIRE** (—1906).

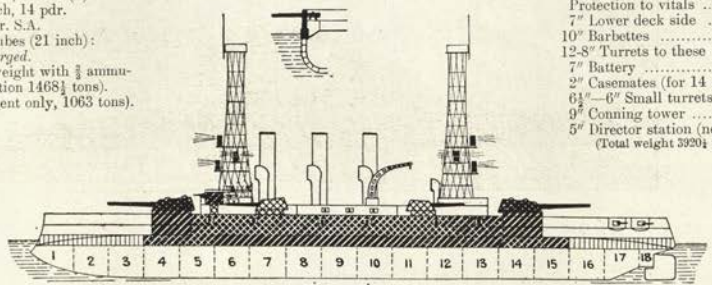
Normal displacement, 16,000 tons. *Full load* displacement, 17,650 tons. Complement, 953 (as flagship *M*, 1013).

Length (*waterline*), 450 feet. Beam, 76⅞ feet. *Maximum* draught, 26¾ feet. Length *over all*, 456¼ feet.

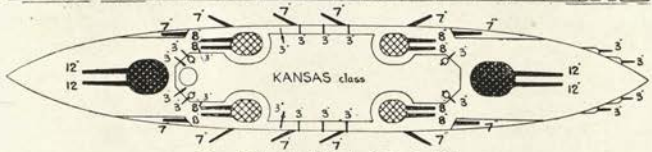
Guns:
4—12 inch, 45 cal. (A^5).
8—8 inch, 45 cal. (*A*).
12—7 inch, 50 cal. (*B*).
20—3 inch, 14 pdr.
4—6 pdr. S.A.

Torpedo tubes (21 inch):
4 *submerged*.
(Total weight with ⅔ ammunition 1468¼ tons).
(Armament only, 1063 tons).

Armour (Krupp):
9″ Belt (amidships) ..... *aa*
4″ Belt (ends) ..... *d*
3″ Deck (slopes) .....
Protection to vitals ..... = *aaa*
7″ Lower deck side ..... *a*
10″ Barbettes ..... *aa*
12-8″ Turrets to these ..... *aaa-a*
7″ Battery ..... *a*
2″ Casemates (for 14 pdrs.).
6½″—6″ Small turrets ..... *b*
9″ Conning tower ..... *aa*
5″ Director station (near C.T.). *c*
(Total weight 3920¼ tons).



Ahead:
2—12 in.
4—8 in.
2—7 in.



Astern:
2—12 in.
4—8 in.
2—7 in.

Broadside: 4—12 in., 4—8 in., 6—7 in.

Machinery: 2 sets vertical 4 cylinder triple expansion. 2 screws (outward turning). Boilers: 12 Babcock. Designed H.P. 16,500 = 18 kts. Coal: *normal* 900 tons; *maximum* 2388 tons (2592 in *N. Hampshire*).

Armour Notes.—Main belt is 9½ feet wide, thick part 285 feet long, gradually thinning to 4″ armour 8 feet wide at ends; lower edge always 25% less thick than waterline. Belt is K.C. up to sills of main deck gun ports, above that H.N. or K.N.C. 11″ barbettes in *N. H.*

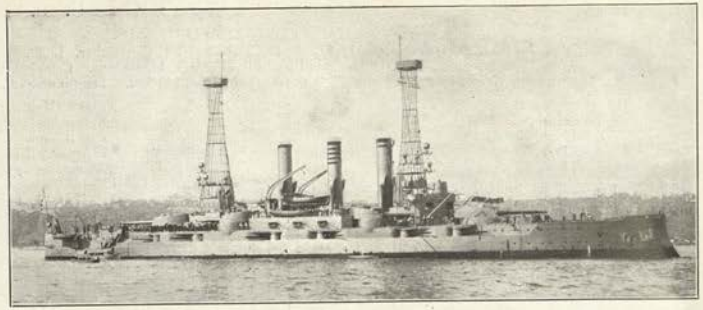
Gunnery Notes.—Loading positions, big guns: all round. Hoists, electric big guns. Big guns manœuvred electrically. Secondary turrets electric control Arcs of fire: Big guns, 270°; Secondary turrets, 135°; 7 inch guns, 110°. Ammunition carried: *normal* 12 inch, 40 rounds per gun; 8 inch, 100 per gun; 7 inch, 100 per gun; full supply ¼ more. Hand hoists to 8 inch and 7 inch guns, also hand loading to big guns.

Torpedo Notes.—21 inch tubes fitted 1908.

Engineering Notes.—Machinery weighs 1500 tons; ‡ stores 26½ tons; reserve water 66 tons. Heating surface 46,750 sq. feet. Grate area 1100 sq. ft. Working pressure, 265lbs. Funnels 100 feet high. Water carried 17,000 gallons. 33 Blowers for forced ventilation. Coal consumption at 10 kts, is 5½ tons an hour. Economical ships.

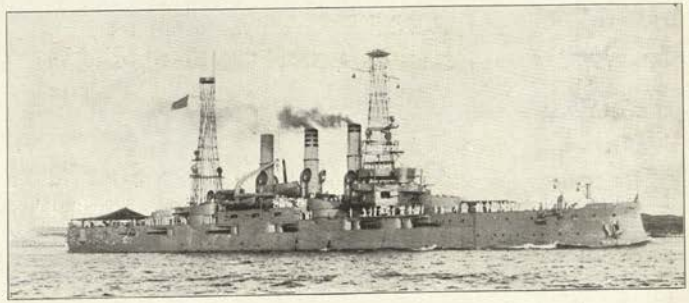
Name.	*Builders*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*	*Boilers*	*Best recent speed*
Kansas	N.Y.Shipb'ld'g	by builders	'04	Apr., '07		19,545 = 18·09	Babcock	18·96
Vermont	Fore River Co.		'04	May, '07		17,741 = 18·33	Babcock	18·96
Minnesota	Newport News		'03	Dec. '06		20,235 = 18·85	Babcock	18·42
New Hampshire	N.Y.Shipb'ld'g		'05	Feb., '08		17,100 = 18·16	Babcock	18·52

General Notes.—Boats, etc., weigh 54½ tons. Masts and spars 31 tons. ‡ Miscellaneous stores 81½ tons. ‡ Small stores, provisions, etc., 144½ tons. Crew, etc., 110 tons. 35 Sliding water-tight doors, and 6 armoured hatches. Freeboard 20½ feet. Authorised 1903 and 1904. These ships are excellent seaboats. Of these ships *Minnesota* and *Vermont* fitted as flagships. *Full load* displacement of *New Hampshire* is 17,784 tons.



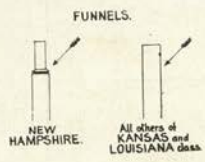
Kansas.

Photo, J. H. Hare, Collier's Weekly.



New Hampshire

Differences.—*New Hampshire* has different funnels (*see photo*).
M. has low cowls: *V.* & *K.* high ones.
M. and *N.H.* round top to main mast: all the others have rectangular.



IDAHO CLASS—2 SHIPS.)

IDAHO (December, 1905). & **MISSISSIPPI** (September, 1905).

Normal displacement, 13,000 tons. *Full load* displacement, 14,465 tons. Complement, 802.

Length (*waterline*), 375 feet. Beam, 77 feet. *Mean* draught, 24⅜ feet. Length *over all*, 382 feet.

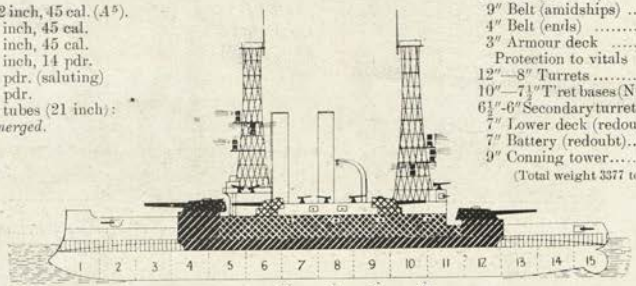
Guns:
4—12 inch, 45 cal. (A[5]).
8—8 inch, 45 cal.
8—7 inch, 45 cal.
12—3 inch, 14 pdr.
4—6 pdr. (saluting)
2—1 pdr.

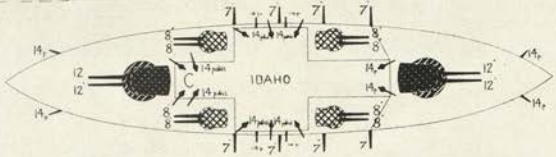
Torpedo tubes (21 inch):
2 *submerged*.

Armour (Midvale):

9″ Belt (amidships)	*aa*
4″ Belt (ends)	*d*
3″ Armour deck	
Protection to vitals ...	= *aaa*
12″—8″ Turrets	= *aaa-a*
10″—7½″ Turret bases (NC)	...*aa-a*
6½″-6″ Secondary turrets (N.C.)	*b*
7″ Lower deck (redoubt)	*a*
7″ Battery (redoubt).....	*a*
9″ Conning tower.....	*aa*

(Total weight 3377 tons).





Ahead:
2—12 in.
4—8 in.

Astern:
2—12 in
4—8 in.

Broadside: 4—12 in., 4—8 in., 4—7 in.

Machinery: 2 sets vertical 4 cylinder triple expansion. 2 screws. Boilers: 8 Babcock. Designed H.P. 14,000=17 kts. Coal: *normal*, 750 tons; *maximum*, 1824 tons.

Armour Notes.—Main belt is 9½ feet wide by 244 feet long; lower edge is 7″ amidships, 5″ at turret bases. Turret bases only 10″ where exposed; only faces of turrets are 12″. 3″ tubes to 8″ turrets.

Gunnery Notes.—Loading positions, big guns: all round. Hoists, electric all guns. Big guns manœuvre electrically; secondary guns, electric and hand gear. Hand loading.

Arcs of fire: 12 in., 270°; 8 in., 135°; 7 in., 110°.

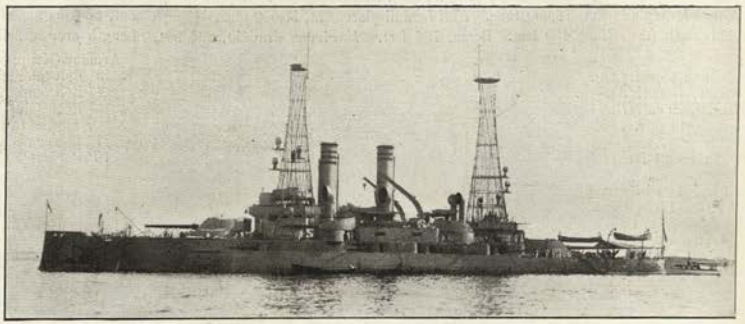
Ammunition carried: 12 in., 60 rounds per gun; 8 in. and 7 in., 125 per gun. (Only ⅔ of this carried normally.)

Height of guns above water: Bow turret, 26½ feet; after turret, 19 feet; 8 inch guns, 26 feet 7 in. guns, 11 feet. *Idaho* has trunked-in hoists to 12 inch guns.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials (mean)*	*Boilers*	*Best recent speed*
Idaho	Cramp's	Cramp	May,'04	Mar., '08	14,010=17·12	Babcock	17·13
Mississippi	Cramp's	Cramp	May,'04	Jan., '08	13,607=17·11	Babcock	17·02

Idaho reached a *maximum* of 18·4 on trial.

General Notes.—Estimated cost *complete*, was about £900,000 per ship. Authorised, 1903. They are particularly interesting ships as they put into practice the "moderate dimensions" theory.



Mississippi is now aviation mother ship.

Differences:—*None.* Both these ships have fore top round and main top rectangular.

1903 U. S. BATTLESHIPS (18 knot). *Second line.*

(Louisiana Class.—2 Ships).

LOUISIANA (August, 1904) & **CONNECTICUT** (September, 1904).

Normal displacement, 16,000 tons. *Full load*, 17,666 tons. Complement, 953 (as flagship, 1008).

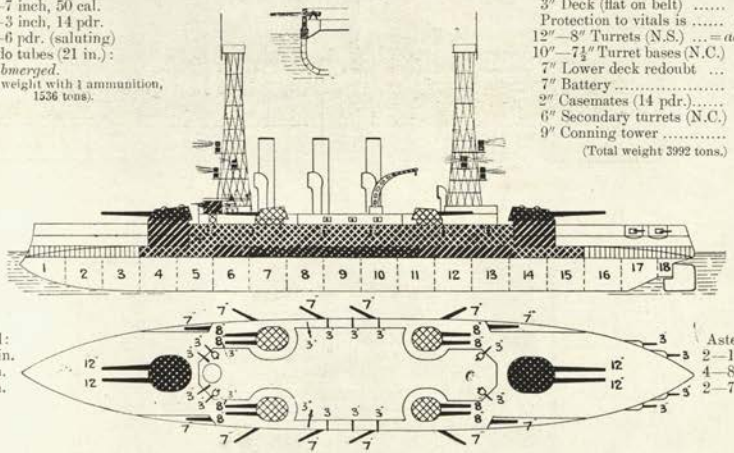
Length (*waterline*), 450 feet. Beam, 76⅞ feet. *Maximum* draught, 26¾ feet. Length *over all*, 456¼ feet.

Guns:
4—12 inch, 45 cal. (A^5).
8—8 inch, 45 cal.
12—7 inch, 50 cal.
20—3 inch, 14 pdr.
4—6 pdr. (saluting)
Torpedo tubes (21 in.):
4 *submerged*.
(Total weight with ½ ammunition, 1536 tons).

Armour (Krupp):

11″ Belt (amidships)	*aaa*
4″ Belt (ends)	*d*
3″ Deck (flat on belt)	
Protection to vitals is	*aaa*
12″—8″ Turrets (N.S.) ...=	*aaa-a*
10″—7½″ Turret bases (N.C.)	*aaa*
7″ Lower deck redoubt ...	*a*
7″ Battery	*a*
2″ Casemates (14 pdr.).....	*f*
6″ Secondary turrets (N.C.)	*b*
9″ Conning tower	*aa*

(Total weight 3992 tons.)



Ahead:
2—12 in.
4—8 in.
2—7 in.

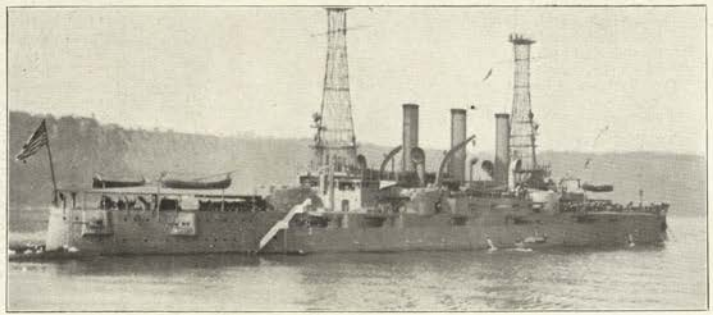
Astern:
2—12 in
4—8 in.
2—7 in.

Broadside: 4—12 in., 4—8 in., 6—7 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 12 Babcock and Wilcox. Designed H.P. 20,525=18 kts. Coal: *normal* 900 tons; *maximum* 2389 tons *Louisiana*, 2452 tons *Connecticut*.

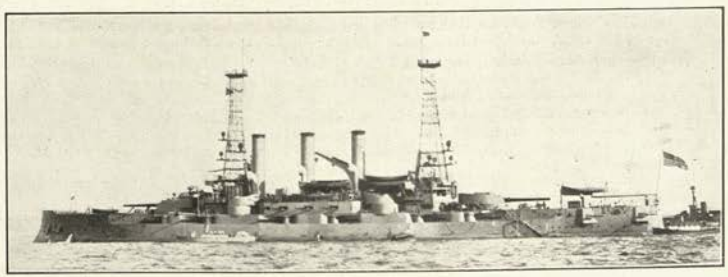
Notes.—All notes to *Kansas* class apply to these which differ only in disposition of the armour deck and belt thickness. *Louisiana's* 7 inch have electric control.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Authorized 1902 *Louisiana*	Newport News		Feb.'03	June '06	20,748=18·82	Babcock	19·02
Authorized 1902 *Connecticut*	New York Yard		Mar.'03	June '06	19,819=18·78	Babcock	



Louisiana.

Connecticut has an admiral's bridge. *Louisiana* has not.
" cowls. " wind sails.



Connecticut. *Photo, Silk*

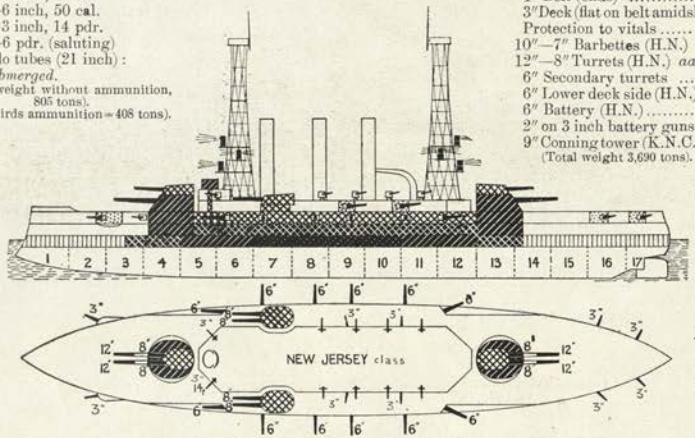
(New Jersey Class—5 Ships).

VIRGINIA (April, 1904), **NEW JERSEY** (November, 1904), **GEORGIA** (October, 1904), **NEBRASKA** (October, 1904), **RHODE ISLAND** (May, 1904).

Normal displacement, 14,948 tons. *Full load* displacement, 16,094 tons. Complement, averages 910.
Length (*waterline*), 435 feet. Beam, 76¼ feet. *Maximum* draught, 26 feet. Length *over all*, 441 feet.

Guns—(Model, '99):
4—12 inch, 40 cal. (A^4).
8—8 inch, 45 cal.
12—6 inch, 50 cal.
12—3 inch, 14 pdr.
4—6 pdr. (saluting)
Torpedo tubes (21 inch):
4 *submerged*.
(Total weight without ammunition, 805 tons).
Two-thirds ammunition = 408 tons).

Armour—(Krupp and H.N.):
11″ Belt (amidships) ... *aaa*
4″ Belt (ends) ..... *d*
3″ Deck (flat on belt amidships)
Protection to vitals ..... *aaa*
10″—7″ Barbettes (H.N.) *aa*
12″—8″ Turrets (H.N.) *aaa-aa*
6″ Secondary turrets ... *b*
6″ Lower deck side (H.N.) *b*
6″ Battery (H.N.) ..... *b*
2″ on 3 inch battery guns *f*
9″ Conning tower (K.N.C.) *aa*
(Total weight 3,690 tons).



Broadside: 4—12 in., 6—8 in., 6—6 in.

Machinery: 2 sets 4 cylinder vertical inverted triple expansion. 2 screws. Boilers: 12 Babcock or 24 Niclausse. Designed H.P. 25,463 = 19 kts. Coal: *normal* 900 tons; *maximum* 1,967 tons.

Armour Notes.—Belt is 8 feet wide, 7 feet of it below waterline (at *maximum* draught); lower edge is 25% thinner than at waterline, except at bow and stern. Protective deck flat on belt amidships, but reinforces sides at ends.

Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric, to big guns: serve: 12 in., 1 in 30 seconds; 8 in., hand hoists. Big guns manœuvred electrically. Secondary turrets electrically. Arcs of fire: 12 in., 270°; superposed 8 in., 270°; beam 8 in., 180°; battery 6 in., 110° (55° before and abaft).

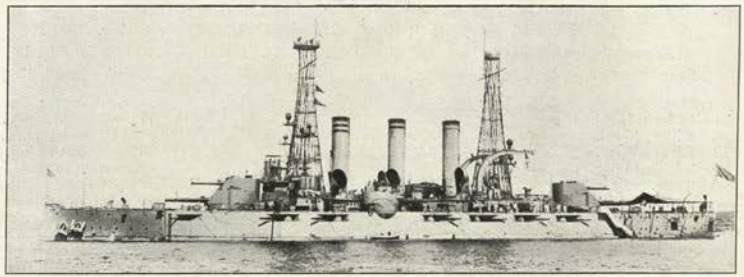
Ammunition carried: 12 in., 60 per gun; 8 in., 125 per gun; 6 in., 200 per gun (only ⅔ normally carried).

Height of guns above water: Fore turret, 26½ feet; axial, 8 in., 32 feet; side 8 in., 26 feet; battery guns, 12 feet.

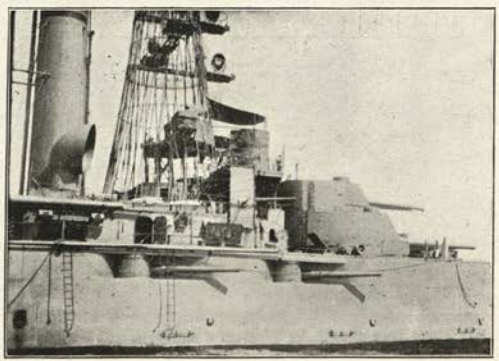
Engineering Notes.—Machinery weighs 1,730 tons + 100 tons reserve water.

Name	*Builders*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
New Jersey	Fore River Co.	by builders	Apr. '02	Mar. '06	23,089 = 19·18	Babcock	19·3
Georgia	Bath Iron W'rks		Aug. '01	Mar. '06	25,088 = 19·26	Niclausse	19·05
Nebraska	Moran Bros.		June '02	May '07	21,283 = 19·06	Babcock	19·11
Rhode Island	Fore River Co.		May, '02	Feb. '06	20,310 = 19·01	Babcock	...
Virginia	Newport News		May, '02	Feb. '06	22,841 = 19·01	Niclausse	19·54

General Notes.—Stores carried: 970 tons. Cost, *complete*, per ship, *about* £1,300,000. Good seaboats, but all roll heavily.



Nebraska



Differences: Georgia has windsails instead of cowls. *N. Jersey* and *V.* have s.l. platform between the funnels. *Virginia, Nebraska* and *Rhode Island* have round main tops. *N.J.* & *G.* rectangular.

(Maine Class.—3 Ships).

OHIO (May, 1901), **MAINE** (July, 1901), **MISSOURI** (December, 1901).

Normal displacement, 12,500 tons. *Full load* displacement, 13,500 tons. Complement, 798.

Length (*waterline*), 388 feet; Beam, 72¼ feet; *Mean* draught, 24 feet; Length *over all*, 394 feet.

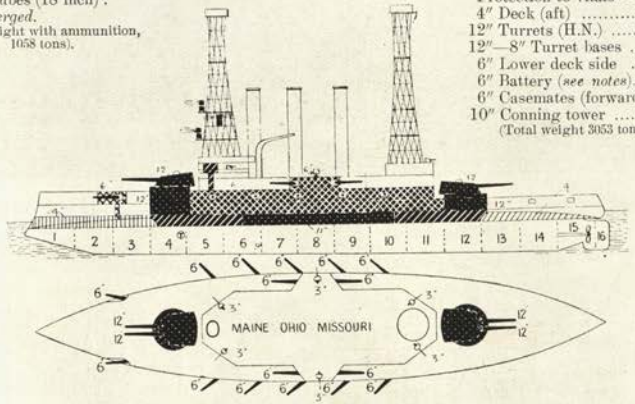
Guns (M. '99):
4—12 in., 40 cal. (A^4) (Mk. III, mod. 3)
16—6 inch, 50 cal. (see *Notes*)
6—3 inch, 14 pdr.
4—6 pdr.

Torpedo tubes (18 inch):
2 *submerged*.
(Total weight with ammunition, 1058 tons).

Armour (Krupp):

11″ Belt (amidships) ...	*aaa*
4″ Belt (bow)	*d*
10″ Bulkhead (aft)	*aaa*
2½″ Deck (on slopes)..... Protection to vitals =	*aaaa*
4″ Deck (aft)	
12″ Turrets (H.N.)	*aaa*
12″—8″ Turret bases ..	*aaa-a*
6″ Lower deck side ...	*a*
6″ Battery (*see notes*)...	*a-b*
6″ Casemates (forward)	*b*
10″ Conning tower	*aa*

(Total weight 3053 tons).



Ahead:
2—12 in
4—6 in.

Astern:
2—12 in.
2—6 in.

Broadside: 4—12 in., 8—6 in.

Machinery: 2 sets vertical inverted triple expansion 3 cylinder, except *Missouri* which is 4 cylinder. 2 screws. Boilers: 12 Thornycroft, except *Maine*, 12 Babcock. Designed H.P. 16,000=18 kts. Coal: *normal* 1,000 tons; *maximum* 2,000 tons.

Armour Notes.—Belt is 7½ feet wide by 300 feet long from bow. Lower edge is 7½″ amidships at 1 foot below water. Armour without deck weighs 2453 tons. Deck 600 tons. Cornpith belt along water line. Battery K.C. to sills of ports; above that K.N.C. (*b*).

Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric for all guns. Big guns manœuvred electrically. The 6 inch guns of *Ohio* are Mark VIII, mod. 2; those of *Maine*, Mark VI, mod. 1 and Mark VI, mod. 2; those of *Missouri*, Mark VI, mod. 2.

Arcs of fire: Big guns 270°; 6 in. 110°.

Ammunition carried: 12 in., 60 rounds per gun; 6 in., 200 per gun (only ⅔ of this normally carried).

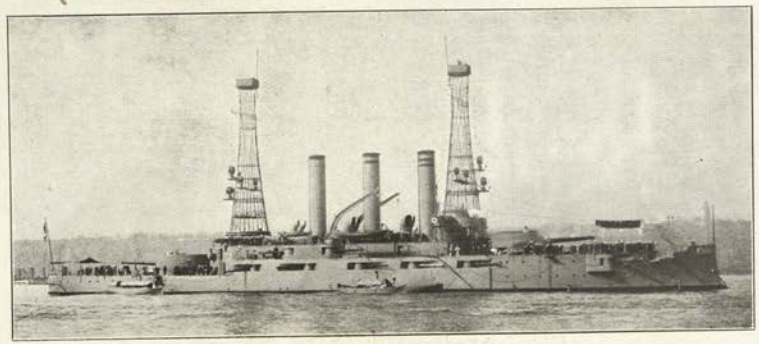
Height of guns above water: Bow turret 26½ feet; After turret guns 19 feet; Conning tower 34½ feet.

Engineering Notes.—Machinery, &c. (with water) weighs 1396 tons. *Maine* reboilered 1911.

Name.	*Where built.*	*Laid down.*	*Completed.*	*Mean speeds: 35 kt. sea trial, 123 revolutions.*	*Boilers.*
Maine	Cramp's	Feb. '99	1902	15,603=18	Babcock
Missouri	Newport News	Feb. '00	1903	15,845=18·15	Thornycroft
Ohio	Union Works, Frisco	April '99	Sept. '04	16,220=16·79	Thornycroft

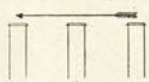
Coal consumption at 10,000 H.P. about 9¾ tons per hour; at 16,000 H.P. about 16¾ tons per hour (18 kts.)

General Notes: Hull weighs 4836 tons; stores 677. Displacement with full stores, coal and ammunition is 13,500 tons. All joiners work fireproof wood. Pneumatic w.t. doors fitted. Indifferent sea-boats; very wet in bad weather.



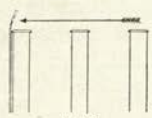
Missouri.

Photo by favour of Collier's Weekly



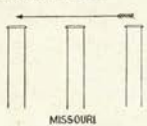
OHIO.

Shorter funnels.
Round top on main.
Small hawse pipes.
High cowls close aft of main mast on superstructure.



MAINE

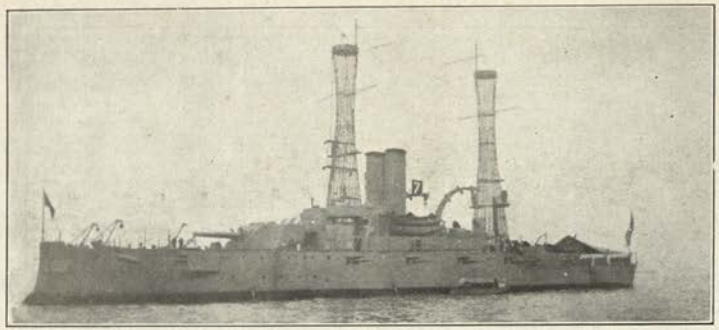
Prominent steam pipes to fore funnel.
Big hawse pipes.



MISSOURI

Small hawse pipes.

1896 U. S. BATTLESHIPS *Second line.*

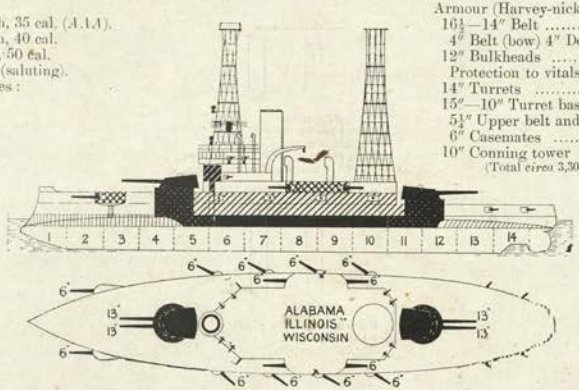


Photo, H. Reuterdahl, Esq.

ALABAMA (May, 1898), **ILLINOIS** (October, 1898), **WISCONSIN** (November, 1898).
Normal displacement, 11,552 tons. *Full load* displacement, 12,150 tons. Complement, 693.
Length (*waterline*), 368 feet. Beam, 72⅙ feet. *Mean* draught, 23¼ feet. Length *over all*, 374 feet.

Guns:
4—13 inch, 35 cal. (*A.A.A*).
14—6 inch, 40 cal.
4—3 inch, 50 cal.
4—6 pdr. (saluting).
Torpedo tubes:
None.

Armour (Harvey-nickel):
16½—14″ Belt .....*aaaa-aaa*
4″ Belt (bow) 4″ Deck (slopes) *d*
12″ Bulkheads ..... *aaa*
Protection to vitals.....=*aaaaa*
14″ Turrets ..... *aaaa*
15″—10″ Turret bases.....*aaaaa*
5½″ Upper belt and battery *c*
6″ Casemates ..... *b*
10″ Conning tower ..... *aa*
(Total *circa* 3,300 tons).



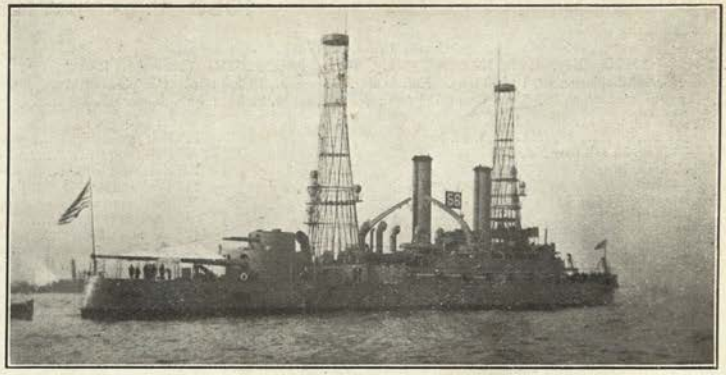
Ahead:
2—13 in.
4—6 in.

Astern:
2—13 in.
2—6 in.

Machinery: 2 sets vertical triple expansion. 3 cylinders. 2 screws. Boilers: single-ended cylindrical, except *Illinois*, Mosher. Designed H.P. *forced* 11,207=16 kts. Coal: *normal* 850 tons; *maximum* 1,450 tons.

Name.	*Built at*	*Machinery.*	*Laid down*	*Completed*	*Trials.*	*Boilers.*	*Best recent speed.*
Alabama	Cramp's		December, '96	1900	11,207=17·01	8 cylindrical	
Illinois	Newport News		February, '97	1901	12,800=17·5 *f.p.*	8 Mosher	
Wisconsin	Union Works, Frisco		February, '97	1901	12,322=17·17	8 cylindrical	

Cost, *complete*, per ship about £950,000. About £130,000 ($667,000) per ship was spent on refit.

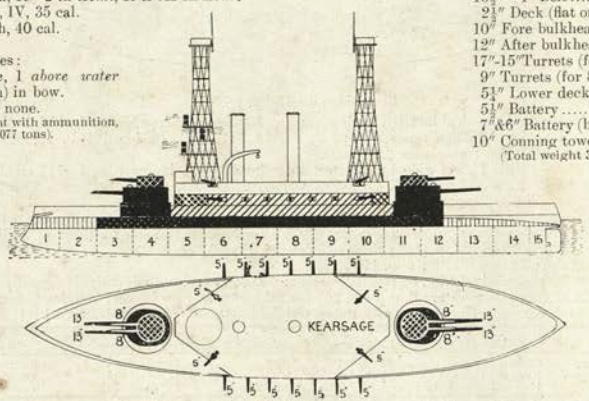


Photo, H. Reuterdahl, Esq.

KEARSARGE & **KENTUCKY** (*both* March, 1898).
Normal displacement, 11,520 tons. *Full load* displacement, 12,320 tons. Complement, 726.
Length (*waterline*), 368 feet; Beam, 72 feet; *Mean* draught, 23½ feet; Length *over all*, 375½ feet.

Guns:
4—13 inch, II—2 in *Kent.*, II & II2 in *Kear.*
4—8 inch, IV, 35 cal.
18—5 inch, 40 cal.
4—6 pdr.
Torpedo tubes:
Kearsarge, 1 *above water* (18 inch) in bow.
Kentucky, none.
(Total weight with ammunition, 1077 tons).

Armour (Harvey-nickel):
16½″—4″ Belt.....*aaaa-d*
2½″ Deck (flat on belt) 4″ aft
10″ Fore bulkhead ..... *aa*
12″ After bulkhead ..... *aaa*
17″-15″Turrets (for 13in.)*aaaa*
9″ Turrets (for 8 inch) *a*
5½″ Lower deck side ... *c*
5½″ Battery ..... *c*
7″&6″ Battery (bulkheads) *a-b*
10″ Conning tower ..... *aa*
(Total weight 3419 tons).



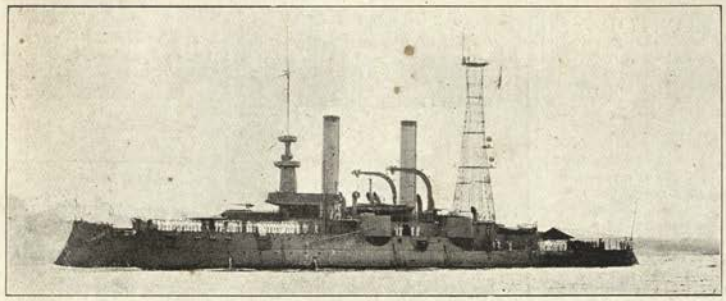
Ahead:
2—13 in.
2—8 in.

Astern:
2—13 in.
2—8 in.

Machinery: 2 sets vertical triple expansion 3 cylinder. 2 screws. Boilers: 8 Mosher (fitted 1910-11). Designed H.P. 10,500=16 kts. Coal: *normal* 410 tons; *maximum* 1210 tons.

Name.	*Builders.*	*Laid down.*	*Completed.*	*40 hours n.d.*	*4 hours forced.*	*Boilers*
Kearsarge	Newport News	June '96	1900	=14·1	=16·84	Mosher
Kentucky	Newport News	June '96	1900	=14·9	=16·89	

General Notes.—Cost *complete*, about £900,000. In refit, 1909-11, turrets were altered to 2 stage hoists: tertiary armament changed, fire controls installed. Four extra 5 inch added 1909. Cost of refit per ship, 675,300 dollars.



IOWA (March, 1896). *Photo, Abrahams & Sons.*

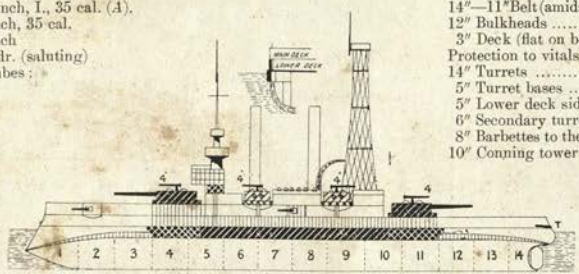
Displacement, 11,346 tons. Complement, 683.

Length (*waterline*), 360 feet. Beam, 72¼ feet. *Maximum* draught, 28 feet. Length *over all*, 362½ feet.

Guns:
4—12 inch, I., 35 cal. (*A*).
8—8 inch, 35 cal.
10—4 inch
4—6 pdr. (saluting)
Torpedo tubes:
None

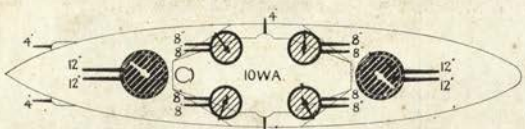
Armour (Harvey):

14″—11″Belt (amidships)	*aa-a*
12″ Bulkheads	*aa*
3″ Deck (flat on belt). Protection to vitals is	*aa*
14″ Turrets	*aa*
5″ Turret bases	*d*
5″ Lower deck side	*d*
6″ Secondary turrets	*c*
8″ Barbettes to these	*b*
10″ Conning tower	*a*



Ahead:
2—12 in.
4—8 in.
2—4 in.

Astern:
2—12 in.
4—8 in.
2—4 in.

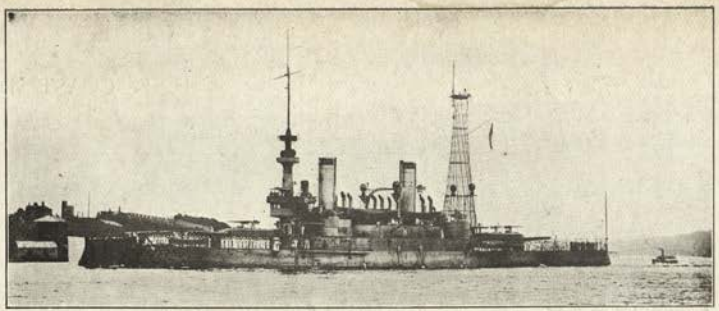


Broadside: 4—12 in., 4—8 in., 5—4 in.

Machinery: 2 sets vertical inverted triple expansion. 2 screws. Boilers: cylindrical. Trial H.P. *forced* 11,933 = 17·09 kts. Coal: *normal* 625 tons; *maximum* 1643 tons.

Armour Notes: Belt is 7½ feet wide by 200 feet long; 5 feet of it below waterline; lower edge is 9½″ thick amidships. Main belt is reinforced by coal bunkers 10 feet thick. 12″ turrets have trunked-in hoists.

General Notes: Laid down at Cramp's, August, 1893; completed 1897. Cost *complete*, nearly £1,000,000.



(Indiana Class—3 Ships.) *Photo, Abrahams & Sons.*

INDIANA (February, 1893), **MASSACHUSETTS** (June, 1893), **OREGON** (October, 1893).

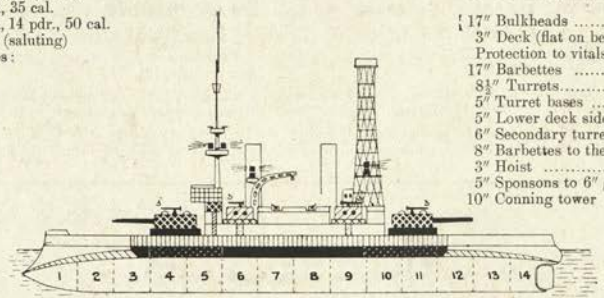
Displacement, 10288 tons. Complement, 678.

Length (*waterline*), 348 feet. Beam, 69½ feet. *Maximum* draught, 28 feet. Length *over all*, 351 feet.

Guns:
4—13 inch, I, (*AAA*).
8—8 inch, 35 cal.
12—3 inch, 14 pdr., 50 cal.
4—6 pdr. (saluting)
Torpedo tubes:
None

Armour (Harvey):

18″-15″ Belt (amidships)	*aaaa-aaa*
17″ Bulkheads	*aaaa*
3″ Deck (flat on belt). Protection to vitals is	*aaaa*
17″ Barbettes	*aaaa*
8½″ Turrets	*a*
5″ Turret bases	*d*
5″ Lower deck side	*d*
6″ Secondary turrets	*c*
8″ Barbettes to these	*b*
3″ Hoist	*e*
5″ Sponsons to 6″ guns	*d*
10″ Conning tower	*a*



Ahead:
2—13 in.
4—8 in.

Astern:
2—13 in.
4—8 in.

Broadside: 4—13 in., 4—8 in., 2—6 in.

Machinery: 2 sets vertical inverted triple expansion 3 cylinder. 2 screws. Boilers: Original cylindrical. Replaced by 8 Babcocks on refit. Designed H.P. 9000 = 17 kts. Coal: *normal* 400 tons; *maximum* 1475 tons.

Armour Notes.—Belt is 7½ feet wide by 200 feet long.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Refit.*	*Trials.*	*Boilers.*	*Present best speed.*
Indiana	Cramps		1891	1895	1905	= 15·53	Babcock in all.	
Massachusetts	Cramps		1891	1893	1907	= 16·21		
Oregon	Union Co., Fris.		1891	1896	1908	= 16·79		

U. S. COAST DEFENCE MONITORS

TONOPAH *Photo. H. Reuterdahl, Esq.*

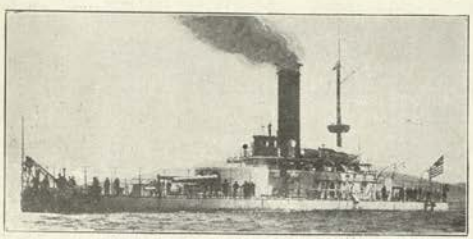
OZARK CLASS.—4 SHIPS.

OZARK (*ex* ARKANSAS), (November, 1900), **TONOPAH** (*ex* NEVADA), (November, 1900).
TALAHASSEE (*ex* FLORIDA), (November, 1901), **CHEYENNE** (*ex* WYOMING), (September, 1900).

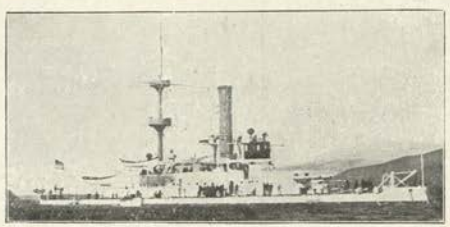
Displacement, 3225 tons; *full load*, 3356 tons. Complement, 130. Length (*waterline*), 252 feet. Beam, 50 feet. *Mean* draught, 12½ feet.

Guns: 2—12 inch, 40 cal. (*A*⁴), 4—4 inch, 50 cal., 3—6 pdr. (automatic). No torpedo tubes. Armour (Krupp): 11″—5″ Belt, 11″ Turrets. Coal: 338—355 tons capacity. *Cheyenne* carries 129 tons coal and 60,816 gals. oil.

Talahassee now carries a small main mast for wireless: she is at present on special service. *Ozark* is lent to Columbia Naval Militia; *Cheyenne* to Washington N.M.; *Tonopah* is tender to Atlantic Submarine Division.

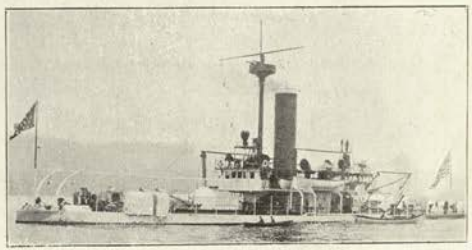


MONTEREY (1891). 4084 tons. Guns: 2—12 inch, 35 cal., in fore turret; 2—10 inch, 30 cal., in after turret; 6—6 pdr. Armour (Harvey): 13″—6″ belt, 8″ turrets. Base of fore turret 14″, of after turret 11½″. Designed H.P. 5000=14 kts. Babcock boilers. Coal, 206 tons. Complement, 231.



MONADNOCK (1883). 3990 tons. Guns: 4—10 inch, 2—4 inch, 4—6 pdr. Armour: iron belt 9″, steel turrets 11½″—7½″. Designed H.P. 3000=14·5 kts. Coal, 386 tons. Complement, 229.

AMPHITRITE (see *Naval Militia*).



MIANTONOMOH (1876). 3990 tons. Guns: 4—10 inch, 2—6 pdr. Armour: iron belt 7″, turrets 11½″ steel. Designed H.P. 1600=12 kts. Coal, 250 tons. Complement, 183.

TERROR (1883). All details as for *Miantonomoh* except Coal, 276 tons and Complement, 229.

1903 U. S. ARMOURED CRUISERS.

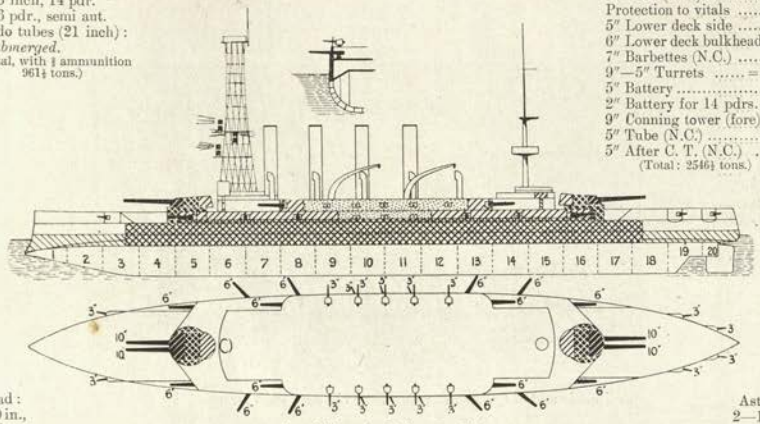
(Washington Class.—4 Ships).

NORTH CAROLINA (7th Oct., 1906), **MONTANA** (December, 1906), **WASHINGTON** (March, 1905), and **TENNESSEE** (December, 1904).

Normal displacement, 14,500 tons. *Full load* displacement, 15,981 tons. Complement, 990 (as flagship), 945 (as private ship).
Length (*waterline*), 502 feet. Beam, 73 feet. *Maximum* draught, 26½ feet. Length *over all*, 504½ feet.

Guns (M. '99):
4—10 inch, 40 cal. (*AAA*).
16—6 inch, 50 cal.
24—3 inch, 14 pdr.
4—6 pdr., semi aut.
Torpedo tubes (21 inch):
4 *submerged*.
(Total, with ¾ ammunition 961½ tons.)

Armour (Krupp; but part Midvale in *N.C.* and *M.*):
5″—3″ Belt ..... *b-e*
3″ Deck (ends) .....
Protection to vitals ..... *a*
5″ Lower deck side ..... *b*
6″ Lower deck bulkheads *a*
7″ Barbettes (N.C.) ..... *a*
9″—5″ Turrets .....=*aaa-b*
5″ Battery ..... *b-e*
2″ Battery for 14 pdrs... *f*
9″ Conning tower (fore) *aa*
5″ Tube (N.C.) ..... *c*
5″ After C. T. (N.C.) ... *c*
(Total: 2546½ tons.)



Ahead:
2—10 in.,
4—6 in.

Astern:
2—10 in.,
4—6 in.

Broadside: 4—10 in., 8—6 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws, outward turning. Boilers: 16 Babcock. Designed H.P. 23,000=22 kts. Coal: *normal* 900 tons; *maximum* 2113 tons.

Armour Notes.—Belt is 17½ feet wide, and of uniform thickness. It reaches to 5 feet below *normal* waterline. 2½″ N.S. tops to turrets. 1½″ screens in battery; 2″ bulkheads. Prot. Deck amidships, 4″ on slopes; the flat part thickened over magazines. 3″ teak backing to all side armour; 2″ to turrets. First two have 8″ on barbettes.

Gunnery Notes.—Turrets electrically manœuvred. Electric and hand hoists. 16 for 6 inch guns, 14 for small guns, 6 inch hoists deliver 8 rounds per minute. All round loading positions to big guns. Arcs of fire: big guns, 270°.

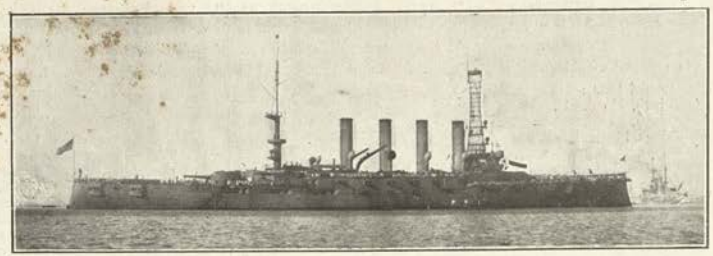
Torpedo Notes.—Electric plant, 600 kilowatt capacity (in 100 K.W. units). Generators, 125 volts.

Engineering Notes:—120 revs.=full speed. 1590 sq. feet grate surface; 68,000 feet heating surface. Boiler pressure, 265 lbs., reduced to 250 lbs. at engines. Machinery weighs 2104-2148 tons. ⅔ stores, 26 tons. Water reserve, 66 tons.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Trials (mean).*	*Boilers.*	*Best recent speed.*
*N. Carolina**	Newport News	By Builders	1905	1908	30,359=22·48	Babcock in all.	
Montana	Newport News		1905	1908	27,938=22·26		
Washington	N. York Shipbuilding		1903	1907	27,152=22·27		
Tennessee	Cramp		1903	1907	26,963=22·16		

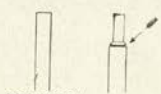
**N. Carolina* did 24 hours 19,800=20·556 knots.

General Notes.—Freeboard forward, 24 feet; amidships, 18 feet.

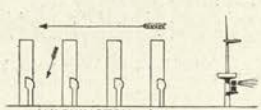


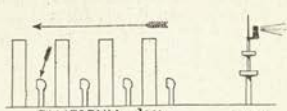
Some are fitted with high searchlight platforms around the funnels. *Photo, Spartali.*

Difference.



Class distinctions.





1901 U. S. ARMOURED CRUISERS (22 knot).

(California Class—6 Ships).

WEST VIRGINIA (April, 1903), **COLORADO** (April, 1903), **PITTSBURG** (Aug., 1903), **MARYLAND** (Sept., 1903), **CALIFORNIA** (April, 1904) & **SOUTH DAKOTA** (July, 1904).

Displacement, *normal*, 13,680 tons, *full load*, 15,138. Complement, 878 (as flagship 921).

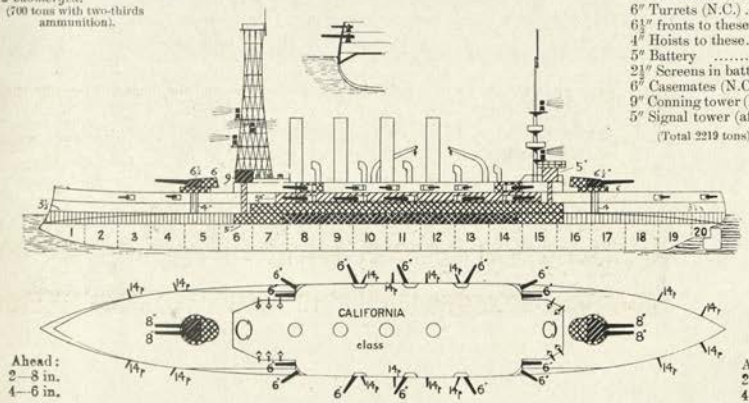
Length (*w.l.*), 502 feet. Beam, 69½ feet. *Maximum* draught, 26½ feet at normal displacement. Length (*o.a.*), 504 feet.

Guns—(model 1899):
4—8 inch, 45 cal. (*A*).
14—6 inch, 50 cal.
18—3 inch, 14 pdr., 50 cal.
4—3 pdr.
Torpedo tubes (18 in.):
2 *submerged*.
(700 tons with two-thirds ammunition).

Armour (Krupp):

6″ Belt	*a*
3½″ Belt (ends)	*de*
4″ Deck (on slopes)	
Protection to vitals	= *aa*
5″ Upper belt	*b*
4″ Bulkheads	*d*
6″ Turrets (N.C.)	*b*
6½″ fronts to these	= *aa*
4″ Hoists to these	*d*
5″ Battery	*b*
2½″ Screens in battery	
6″ Casemates (N.C.)	*b*
9″ Conning tower (N.C.)	*aa*
5″ Signal tower (aft)	*e*

(Total 2219 tons).



Ahead:
2—8 in.
4—6 in.

Astern:
2—8 in.
4—6 in.

Broadside: 4—8 in., 7—6 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: See *Engineering Notes*. Designed H.P. 23,000 = 22 kts. Coal: *normal* 900 tons; *maximum* 1929 tons.

Gunnery Notes.—8 inch manœuvred electrically and by hand; electric hoists supply 1 round per 50 seconds.
6 „ „ by hand; „ „ „ 3 „ „ minute.

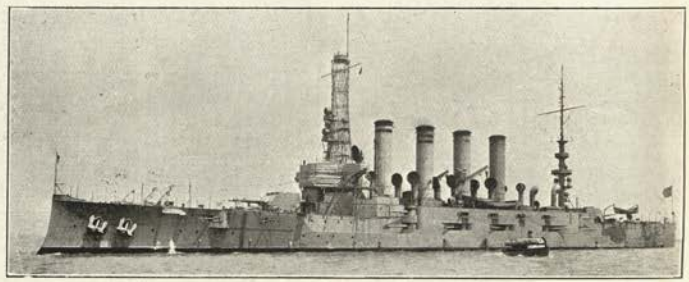
Rounds per gun: 8 inch, 125; 6 inch, 200; 14 pdr., 250; lesser guns, 500 per gun.

Arcs of fire: 8 inch, 270°; casemate and angles of battery, 6 inch, 150°; remaining *starboard*, 6 inch, 75° before the beam and 55° abaft; remaining *port* guns, 55° before only, and 75° abaft; 3 inch, all about 135°.

Armour Notes.—Main belt amidships 244 feet long by 7½ feet wide, 6½ feet below water, 1 foot above. Lowest strake of it is 5″ thick. Deck behind belt amidships is only about 2½″ on slopes. Cellulose belt. Upper belt, 232 feet long and 7½ feet wide, forming redoubt with 4″ bulkheads.

Engineering Notes.—Grate area 1,600 square feet. Heating surface 70,944 square feet. Weight of machinery and boilers, with water, 2,100 tons. The Niclausse boilers of *Pittsburg* and *Colorado* are being gradually replaced by Babcocks. Cylinders: 38½, 63½, 74 and 74 inch. Stroke 48.

General Notes.—Authorised 1899 and 1900. Average cost, *complete*, about £1,200,000 per ship. *Pittsburg* was formerly named *Pennsylvania*.



Photo, Müller.

California and *S. Dakota* are without the big cowl abaft foremast.

Class distinction.—Smaller turrets than *Washingtons*.

Name	*Where built*	*Machinery*	*Laid down*	*Completed*	*4 hours full power trial. I.H.P.*	*Kts.*	*Boilers*	*Present best speed*
California	Union Ironw'k.	By builders in each case.	1902	1907	29,381 =	22·20	Babcock	
Pittsburg	Cramp's		1901	1905	28,600 =	22·44	Bab. & Nic.	
West Virginia	Newport News		1901	1905	26,135 =	22·14	Babcock	
Colorado	Cramp's		1901	1905	26,837 =	22·24	Bab. & Nic.	
Maryland	Newport News		1901	1906	28,059 =	22·41	Babcock	22·5
South Dakota	Union Ironw'k.		1902	1907	28,543 =	22·24	Babcock	22·4

1902 U. S. FIRST CLASS CRUISERS (21½ knot).

(St. Louis Class.—3 Ships.)

CHARLESTON (Jan., 1904), **MILWAUKEE** (Sept., 1904), **ST. LOUIS** (May, 1905).

Sheathed and coppered.

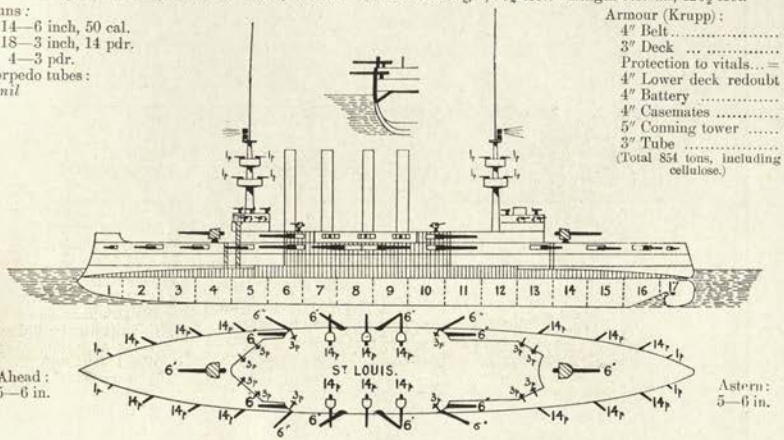
Displacement, *normal*, 9700 tons, *full load*, 10,839 tons. Complement, 727.

Length (*waterline*), 424 feet. Beam, 66 feet. *Maximum* draught, 23¼ feet. Length *over all*, 426½ feet.

Guns:
14—6 inch, 50 cal.
18—3 inch, 14 pdr.
4—3 pdr.

Torpedo tubes:
nil

Armour (Krupp):
4″ Belt ..... *d*
3″ Deck ....
Protection to vitals... = *b*
4″ Lower deck redoubt *d*
4″ Battery ..... *d*
4″ Casemates ..... *d*
5″ Conming tower ..... *d*
3″ Tube .....
(Total 854 tons, including cellulose.)



Ahead: 5—6 in.

Astern: 5—6 in.

Broadside fire: 8 –6 in.

Machinery: 2 sets vertical 4 cylinder triple expansion. 2 screws. Boilers: 16 Babcock and Wilcox. Designed H.P. 21,000 = 21·5 kts. Coal: *normal* 650 tons; *maximum* 1776 tons.

Armour Notes—The belt is partial; 197 feet long, by 7½ feet wide. Armour weighs 854 tons.

Gunnery Notes—All guns fitted with electric hoists, which will serve 6 rounds per minute to 6 inch guns, and 15 per minute to the 3 inch 14-pounder guns.

Arcs of fire: Fore and aft 6 inch, 270°; upper casemate guns 145° from axial line; end guns main deck 130° (85° ahead and 55° astern for fore ones, *vice versâ* for after): other guns 110°.

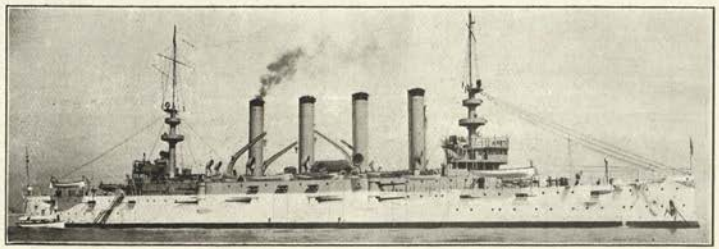
Weight of ammunition *normal* 519 tons.

Engineering Notes.—Heating surface 64,000 sq. ft., grate area, 1,400 sq. ft., working pressure 265, cylinders 36, 59½, 69 and 69 inches diameter. Stroke 45 inches. Average weight 1,800 tons. Electric plant 2 sets 100 k.w., 125 v. and 3 sets 50 k.w., 125 v.

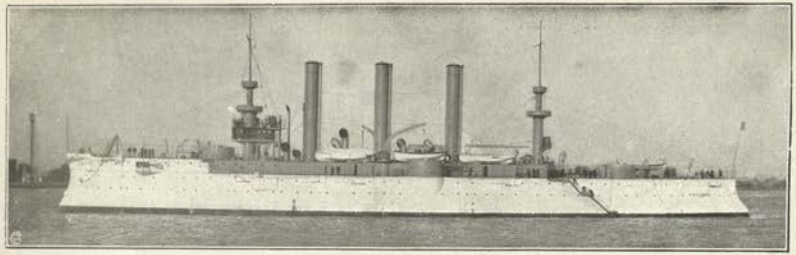
Name.	*Builders.*	*Machinery.*	*Laid down.*	*Completed*	*Refit.*	*Trials, 5 runs mile f.p. at 143 revs.*	*Boilers.*	*Present best speed.*
Charleston	Newport News		1902	1905		27,200 = 22·04	Babcock	
Milwaukee	Union I.W., 'Frisco		1902	1906		24,166 = 22·22	Babcock	
St. Louis	Neafie & Levy		1902	1906		27,264 = 22·13	Babcock	22·4

Consumption: Burn about 19¼—20 tons an hour at 21,000 H.P.

General Notes—Hull and armour deck weigh 5346 tons. Although armoured amidships these ships are not officially rated as armoured cruisers.



St. Louis. *Photo, Müller.*



Photo, Rau.

BROOKLYN (1895).

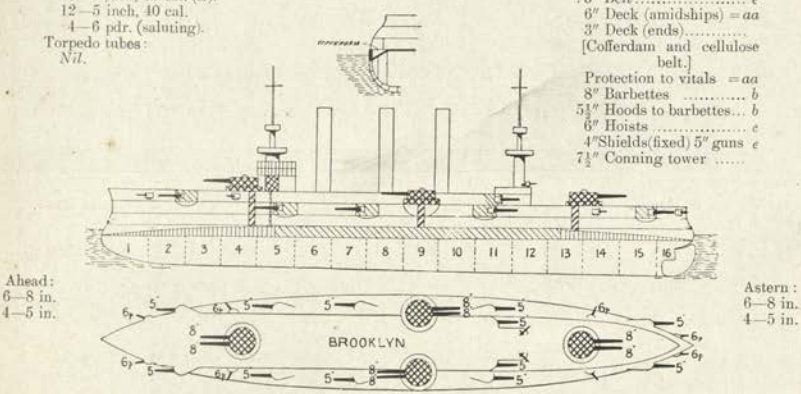
Normal displacement, 9215 tons; *full load*, 10,068 tons. Complement, 572.

Length (*waterline*), 400½ feet. Beam, 65¾ feet. *Maximum* draught, 28 feet.

Guns:
8—8 inch, 35 cal. (*E*).
12—5 inch, 40 cal.
4—6 pdr. (saluting).

Torpedo tubes:
Nil.

Armour (Harvey):
3″ Belt ..... *e*
6″ Deck (amidships) = *aa*
3″ Deck (ends) .....
[Cofferdam and cellulose belt.]
Protection to vitals = *aa*
8″ Barbettes ..... *b*
5½″ Hoods to barbettes... *b*
6″ Hoists ..... *e*
4″Shields(fixed) 5″ guns *e*
7½″ Conning tower .....



Ahead:
6—8 in.
4—5 in.

Astern:
6—8 in.
4—5 in.

Broadside: 6—8 in., 6—5 in.

Machinery: 4 sets vertical triple expansion. 2 screws. Boilers: cylindrical; 5 double-ended and 2 single-ended. Designed H.P. *forced* 18,000 = 21 kts. Coal: *normal* 900 tons; *maximum* 1350 tons.

Armour Notes.—The belt is 8 feet wide, and 267 feet long. There are no armoured bulkheads at end of belt.

Engineering Notes.—On first *trial* (4 hours) she made *mean* I.H.P. 18,769 = 21·91 knots (138-140 revolutions). She was very light, and has not since equalled this performance, but steams well. Laid down 1893. Completed 1896. Reconstructed 1909, onward. Two-stage hoists fitted to turrets, also given fire controls, etc.

SARATOGA (*ex New York*) (December, 1891.) (Reconstructed 1907-08.)

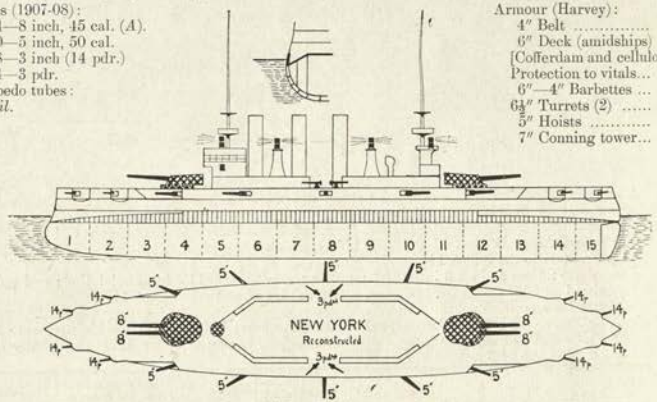
Normal displacement, 8150 tons; *full load*, 8900 tons. Complement, 525.

Length (*waterline*), 380 feet. Beam, 64 feet. *Maximum* draught, 28 feet.

Guns (1907-08):
4—8 inch, 45 cal. (*A*).
10—5 inch, 50 cal.
8—3 inch (14 pdr.)
4—3 pdr.

Torpedo tubes:
Nil.

Armour (Harvey):
4″ Belt ..... *d*
6″ Deck (amidships) [Cofferdam and cellulose.]
Protection to vitals... = *a*
6″—4″ Barbettes ...
6½″ Turrets (2) ..... *b*
5″ Hoists ..... *d*
7″ Conning tower... *b*



Ahead:
4—8 in.
4—4 in.

Aste
4—8
4—4

Broadside: 5—8 in., 6—4 in.

Machinery: 4 sets vertical triple expansion. 2 screws. Boilers: (1907), 12 Babcock. Designed H.P. *forced* 16,500 = 21 kts. Coal: *normal* 750 tons; *maximum* 1075 tons.

Armour Notes.—Belt is 200 feet long.

Gunnery Notes.—The 8 inch turrets are electrically manœuvred with electric hoists.
Ares of fire: Fore turret, 310°. After turret, 300°. 5 inch guns, 120°.

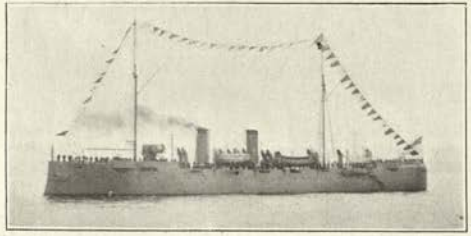
Engineering Notes.—On first trials she made 21 kts. with I.H.P. 17,400. She has always been a good steamer.

General Notes.—Good sea boat. Laid down at Philadelphia, September, 1890. Completed 1893. Re-constructed 1907-08.

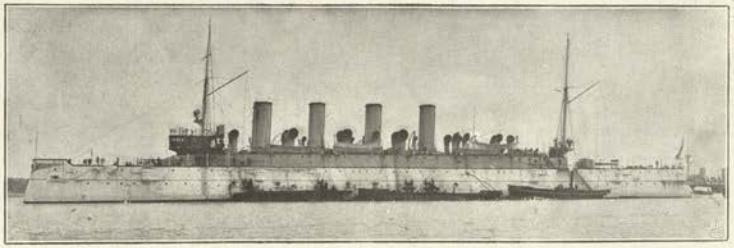
OLYMPIA (November, 1892). Displacement, 5870 tons. Complement, 446. Length (*waterline*), 340 feet. Beam 53 feet. *Maximum* draught, 25 feet. Guns: 4—8 inch, 35 cal., 10—5 inch, 40 cal., 4—6 pdr. Armour: $4\frac{3}{4}$″ deck.

Machinery: 2 sets vertical inverted triple expansion. 2 screws. Boilers: cylindrical; 4 double-ended and 2 single-ended. 40 furnaces. Designed H.P. *forced* 17,000 = 21·69 kts. Coal: *normal* 500 tons; *maximum* 1000 tons.

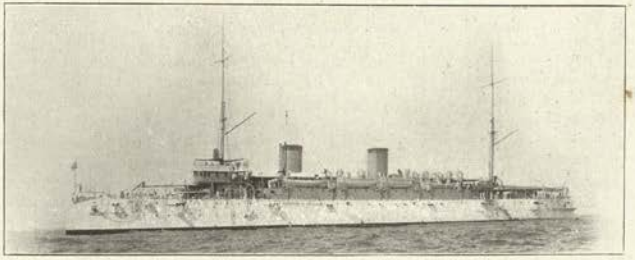
General Notes.—Laid down at San Francisco, June 1891. Completed 1895. Cost, *complete*, about £550,000. Flagship Admiral Dewey at battle of Manilla. Reconstructed partially 1901-03.



BALTIMORE (1888). Displacement, 4413 tons. Complement, 374. Dimensions: 327 (*w.l.*) × $48\frac{1}{2} \times 19\frac{1}{2}$ (*mean*) feet. Guns: 12—6 inch, 40 cal., 4—6 pdr. Armour: 4″ deck. Designed H.P. 8500 = 20 kts. Boilers: 8 Babcock. Coal: *maximum* 1075 tons.



COLUMBIA. *Photo, Symonds.*



MINNEAPOLIS. *Photo, Geiser.*

COLUMBIA (July, 1892), & **MINNEAPOLIS** (August, 1893). Displacement, 7,350 tons. Complement, 524. Length (*waterline*), 412 feet. Beam, 58 feet. *Maximum* draught, $25\frac{1}{2}$ feet. Guns: 3—6 inch, 45 cal., 8—4 inch, 40 cal., 4—6 pdr.

Machinery: 3 sets vertical inverted triple expansion. 3 screws. Boilers: 8 double ended, 2 single ended cylindrical. Designed H.P. *forced* 18,500 = 22·80 kts. Coal: *normal* 750 tons; *maximum* 1525 tons.

1905 U. S. THIRD CLASS CRUISERS.

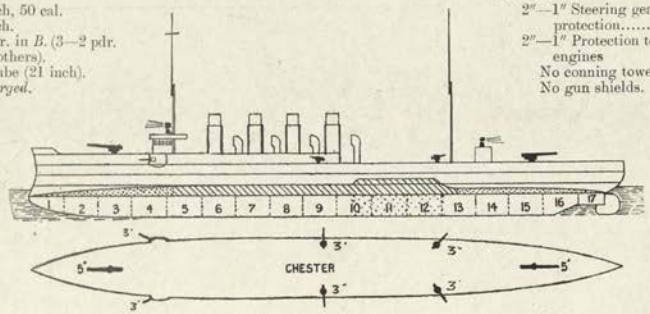
SALEM (October, 1907), **BIRMINGHAM** (May, 1907), **CHESTER** (June, 1907).

Normal Displacement, 3750 tons. Full load, 4687 tons. Complement, 373.

Length (*waterline*), 420 feet. Beam, 47 feet. *Maximum* draught, 19¼ feet. Length *over all*, 423 feet.

Guns:
2—5 inch, 50 cal.
6—3 inch.
2—6 pdr. in *B.* (3—2 pdr. in others).
Torpedo tube (21 inch).
2 *submerged*.

Armour:
2″—1″ Steering gear protection..... *f*
2″—1″ Protection to engines
No conning tower.
No gun shields.



Ahead: 1—5 in.

Astern: 1—5 in.

Broadside: 2—5 in.

Machinery: *Salem*, Curtis turbine. 2 screws. *Chester*, Parsons' turbine. 4 screws. *Birmingham*, 2 sets 4 cylinder triple expansion. 2 screws. Boilers: various (*see Notes*). Designed H.P. 16,000=24 kts. Coal: *normal* 475 tons; *maximum*, *Salem* and *Birmingham*, 1400 tons; *Chester*, 1375 tons.

Armour Notes.—Double skin over machinery space from 3½ feet below water to 9½ feet above.

Gunnery Notes.—Hoists, electric, 4.

Torpedo Notes.—Eight 21 inch torpedoes carried.

Engineering Notes.—Burnt per 24 hours: *Birmingham* 148 tons, *Chester* 154, *Salem* 200 tons—all at 20 knots.

Name.	*Builder.*	*Laid down.*	*Completed.*	*Refit.*	*Trials:— 4 hours full p.*	*Boilers.*	*Best recent speed.*
Salem (t)	Fore River Co.	Aug., '05	Mar., '08		25,400=25·95	Babcock	
Birmingham	Fore River Co.	Aug., '05	Mar., '08		15,670=24·32	12 Fore River	
Chester (t)	Bath Ironworks	Sept., '05	May, '08		19,578=26·52	12 Fore River	

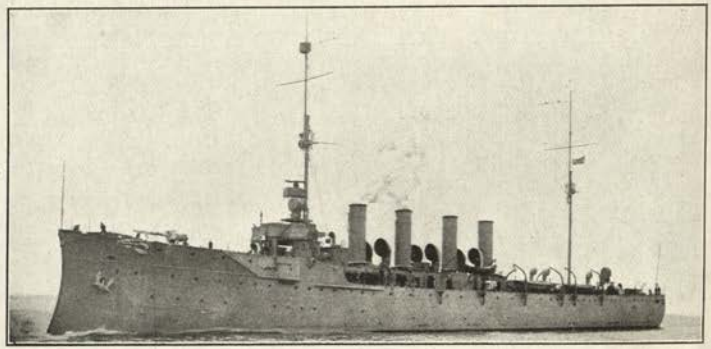
General Notes:—Authorised 1904. Average cost, *exclusive of armament*, £325,000 each. These ships are good sea boats, but roll heavily.

Extra Engineering Notes.—

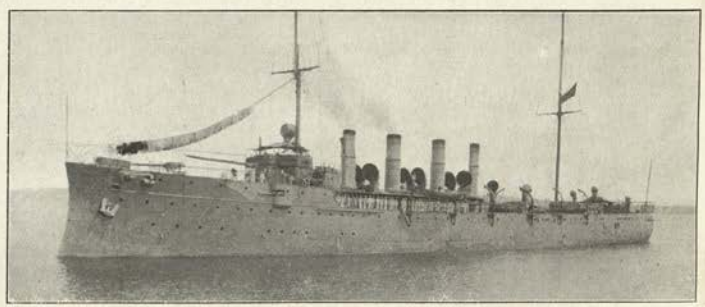
Test No. 1.—10 kts. speed; duration of trial, 96 hours:—
Feed water, tons daily: *Birmingham*, 10·55; *Chester*, 10·97; *Salem*, 11·66. Coal, tons daily: *Birmingham*, 31·74; *Chester*, 40·44; *Salem*, 53·85.

Test No. 2.—15 kts. speed; duration of trial, 50 hours:—
Feed water, *Birmingham*, 13·9; *Chester*, 13·2; *Salem*, 12·12. Coal: *Birmingham*, 71·23; *Chester*, 85·62; *Salem*, 107.23.

Test No. 3.—20 kts. speed; duration of trial, 98 hours:—
Feed water, *Birmingham*, 26·1; *Chester*, 16·8; *Salem*, 17·51. Coal: *Birmingham*, 153·47; *Chester*, 157·15; *Salem*, 202·03.



CHESTER. *Photo, Müller.*



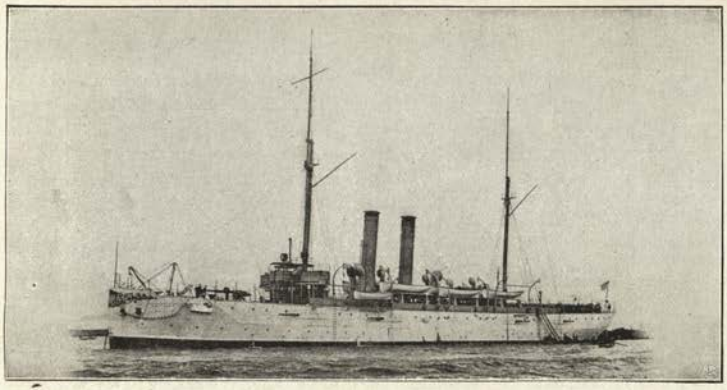
Photo, F. Herbert, U.S.N.

BIRMINGHAM & SALEM. Funnel casing ceases half way up. Fire control platforms now fitted over searchlight on fore.

Test No. 4.—Maximum speed; duration of test, 24 hours:—
Feed water, *Birmingham*, 12·04; *Chester*, 27; *Salem*, 45·625. (Owing to an accident the *Birmingham* discontinued the test after 12 hours.)

On the second of the coal-and-water-consumption tests the *Birmingham* consumed 70·2 tons of coal and 23·3 tons of water; the *Chester* 82·8 tons of coal and 23·3 tons of water; the *Salem* 105·6 tons of coal and 12·68 tons of water.

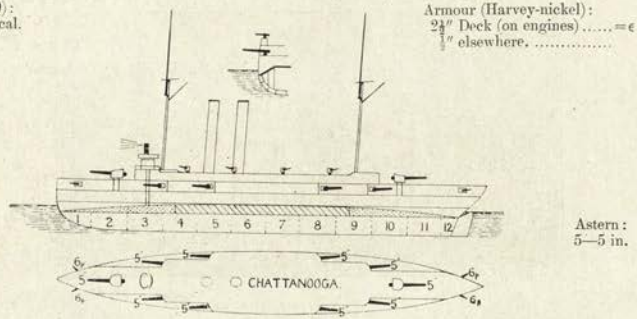
Third test, 100 hours at 20 kts.:—
Coal, *Birmingham*, 148 tons per 24 hours; *Chester*, 154; *Salem*, 200.



CHATTANOOGA (March, 1903), **CLEVELAND** (September, 1901), **DENVER** (June, 1902), **DES MOINES** (September, 1902), **GALVESTON** (July, 1903), & **TACOMA** (June, 1903).
(Wood sheathed and coppered). *Normal* Displacement, 3,200 tons. Complement, 309.
Length (*waterline*), 292 feet. Beam, 44 feet. *Maximum* draught, 17¼ feet. Length *over all*, 309 feet.

Guns (model 1899):
10—5 inch, 50 cal.
8—6 pdr.
Torpedo tubes:
Nil.

Armour (Harvey-nickel):
2½″ Deck (on engines).....=c
1″ elsewhere. .....



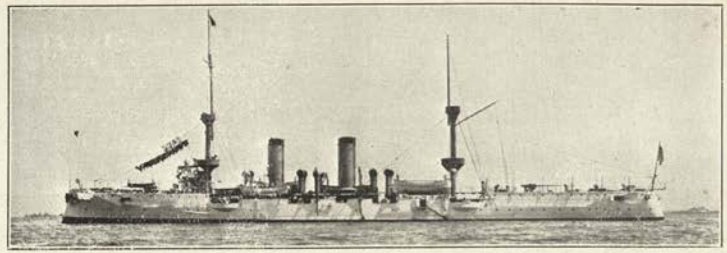
Ahead:
5—5 in.

Astern:
5—5 in.

Broadside: 6—5 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 6 Babcock & Wilcox. Designed H.P. 5,398=16·5 kts. Coal: *normal* 467 tons; *maximum* 733 tons=7,000 miles at 10 kts. *nominal*
Notes.—15 "Long arm" doors to the first four.

Name.	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials full p.*	*Boilers*	*Present best speed*
Chattanooga	Crescent Co. P.		1900	1904		5303=16·65		...
Cleveland	Bath Ironw'rks		1900	1904		4640=16·45		...
Denver	Neafie & Levy		1900	1904		5558=16·75	Babcock in all.	...
Des Moines	Fore River Co.		1900	1904		5135=16·74		15·7
Galveston	W. R. Trigg		1900	1904		5075=16·4		...
Tacoma	Union Ironw'k.		1900	1904		5288=16·58		16

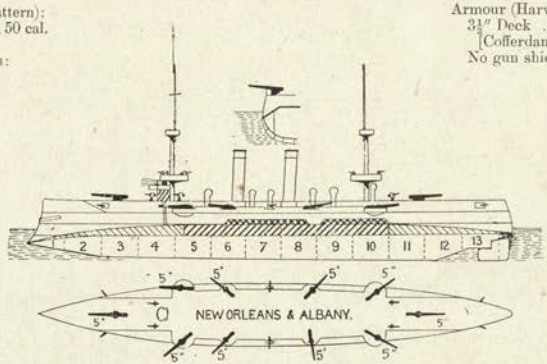


Photo, Müller.

NEW ORLEANS (Dec., 1896) & **ALBANY** (Jan., 1899). (Both purchased 1898).
Normal Displacement, 3430 tons. Complement, 346.
Length (*w.l.*), 346 feet. Beam, 43¾ feet. *Maximum* draught, 17½ feet. Length *over all*, 354 feet.

Guns (U.S. pattern):
10—5 inch, 50 cal.
8—3 pdr.
Torpedo tubes:
removed.

Armour (Harvey-nickel):
3½″ Deck .....=c
[Cofferdam amidships].
No gun shields.



Ahead:
3—5 in.

Astern:
3—5 in.

Broadside: 6—5 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 4 double-ended Scotch. Designed H.P. *forced* 7500=20·25 kts. Coal: *normal* 450 tons; *maximum* 821 tons.
General Notes.—Laid down at Elswick (for Brazil) and purchased by U. S. just before war with Spain. Re-armed with U. S. guns, 1907.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials n.d.*	*Trials f.d.*	*Boilers*	*Best recent speed*
Albany	Elswick	Hawthorn Leslie	1897	1900	=19·8	=20·5	Cylindrical	20·7
New Orleans	Elswick	Humphreys & T.	1895	1898	=19·1	=20	Cylindrical	20·1

1889 U. S. PROTECTED CRUISERS (18½ knot).

(Cincinnati Class—2 Ships).

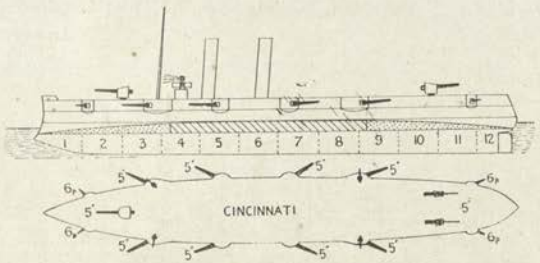
RALEIGH (March, 1892), & **CINCINNATI** (November, 1892).

Displacement, 3213 tons. Complement: 313.

Length (*w.l.*), 300 feet. Beam, 42 feet. *Maximum* draught, 20¼ feet. Length *over all*, 306 feet.

Guns (M. '99)
11—5 inch, 40 cal.
3—3 pdr. S.A. (but *C.* has instead 6—6 pdr. S.A.)
Torpedo tubes:
Nil.

Armour (steel):
2½" Armour deck.....=
Protection to vitals ...=
2" Conning tower.....



Ahead: 3–5 in.

Astern: 4—5 in.

Broadside: 6–5 in.

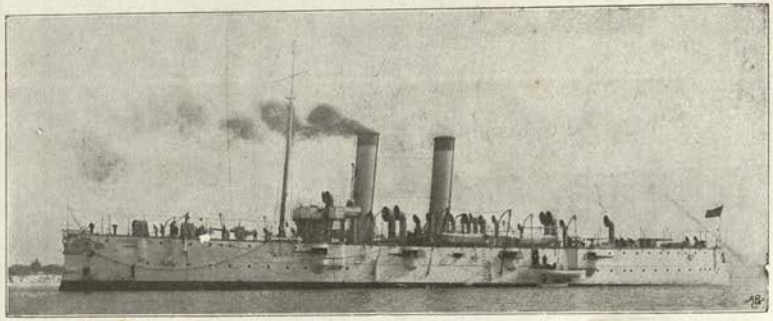
Machinery: 2 sets 4 cylinder vertical triple expansion (new 1900-2). 2 screws. Boilers: Babcock and Wilcox. Designed H.P. 8,000=18 kts. Coal: *normal* 396 tons; *maximum* 575 tons.

Gunnery Notes.—Re-armed 1902-3. Hoists, electric.

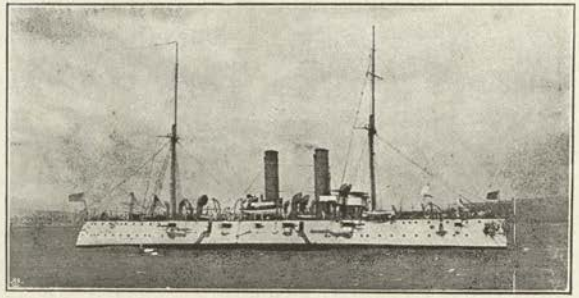
Torpedo Notes.—No torpedo tubes.

Engineering Notes.—

Name.	*Built at*	*Laid down*	*Completed*	*Recon-structed.*	*Full power trial.*	*Boilers.*	*Last recorded full speed*
Raleigh	Norfolk	Dec., '89	1894	1901	8500=	Babcock	21·12
Cincinnati	Brooklyn	Jan., '90	1894	1902	8490=	Babcock	19·91



Cincinnati. *Photo, Loeffler.*

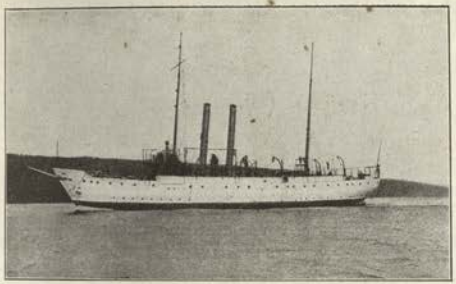


Raleigh *Photo, His Honour Mr. Justice Ballou.*

Differences.—Easily differentiated by rig.

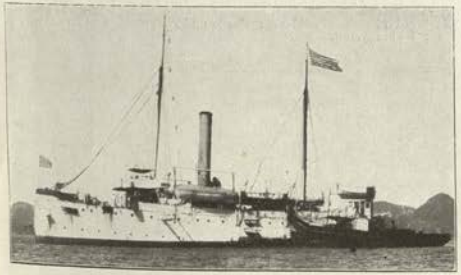
Class distinction.—*Raleigh* easily distinguished from *Montgomery* class by stern (see *Montgomery*).

U. S. GUNBOATS.



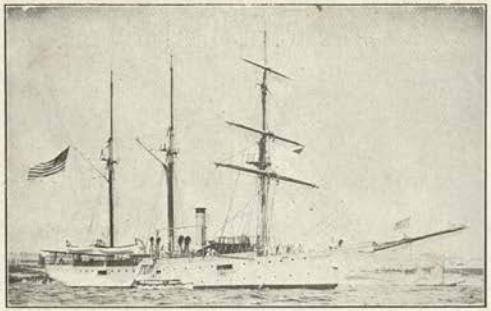
PADUCAH (1904).
Normal displacement, 1085 tons. Complement, 162.
Length (*waterline*), 174 feet. Beam, 35 feet. *Mean* draught, 13½ feet.
Guns: 6—4 inch 50 cal.; 4—6 pdr.; 2—1 pdr.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 2 Babcock. Designed H.P. 1000 = 12·9 kts. Coal: *normal*, 100 tons; *maximum* 236 tons.
Dubuque of this class now Naval Militia.



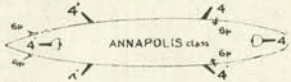
WHEELING (1897).
Normal displacement, 1000 tons. Complement, 163.
Length (*waterline*), 174 feet. Beam, 34 feet. *Mean* draught, 12 feet.
Guns: 6—4 inch, 40 cal.; 4—3 pdr.; 2—1 pdr.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: *Marietta*, 2 Babcock; *Wheeling*, 2 single ended. Designed H.P. 1250 = 13 kts. Coal: *normal*, 120 tons; *maximum*, 250 tons. *Nominal* radius: 4000 at 10 kts. A sister, *Marietta*, lent to Naval Militia.



Photo, Abrahams & Sons.

ANNAPOLIS (1896), **PRINCETON** (1896), **VICKSBURG** (1896).
Normal displacement, 1000 tons. Complement, 160.
Length (*waterline*), 168 feet. Beam, 36 feet. *Mean* draught, 12 feet.
Guns: 6—4 inch; 4—6 pdr.; (except *A*) 2—1 pdr.

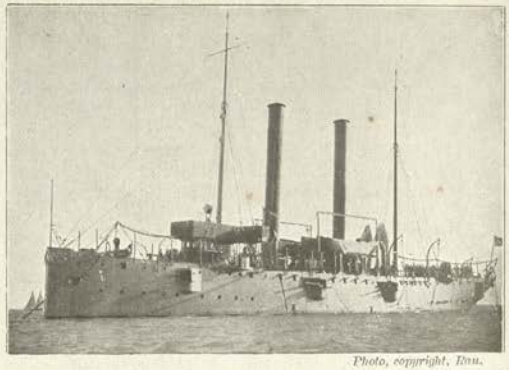


Machinery: 1 set vertical triple expansion. 1 screw. Boilers: *Annapolis*, 2 Babcock; others, 2 single ended. Designed H.P. 1227 = 12 kts. Coal: *normal*, 100 tons; *maximum*, 226 tons.
Notes.—*Princeton* fitted to burn liquid fuel. *Newport* of this class lent to N.Y. Board of Education. Mainmast removed.

Photo, copyright, Rau.

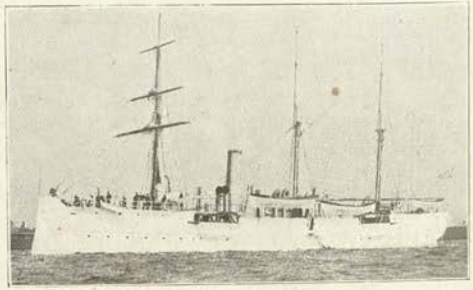
HELENA (1896) & **WILMINGTON** (1895).
Displacement, 1397 tons. Complement, 187.
Length (*waterline*), 250¾ feet. Beam, 40 feet. *Mean* draught, 9 feet.
Guns: 8—4 inch, 40 cal.; 4—3 pdr.

Machinery: 2 sets vertical triple expansion. 2 screws. Designed H.P. 1988 = 13 kts. Coal: *normal*, 100 tons; *maximum*, 300 tons. *Nominal* radius: 2200 miles at 10 kts.



Photo, copyright, Rau.

NASHVILLE (1895). 1371 tons. Guns: 8—4 inch, 4—6 pdr., 2—1 pdr., 2 machine. 2¼″ sponsons to 4 inch guns. H.P. 2500 = 16 kts. Coal: 363 tons. Complement 182.



Now carries one signal yard only on fore.

PETREL (1888).
Displacement, 892 tons. Complement, 142.
Length, 181¼ feet. Beam, 31 feet. *Mean* draught, 11¾ feet.
Guns: 4—4 inch, 40 cal., 2—3 pdr., 2—1 pdr.
Machinery: Horizontal compound. 1 screw. Boilers: 4 cylindrical. Designed H.P. 1000 = 11·5 kts. Coal: *normal*, 100 tons; *maximum*, 200.

River Gunboat.

SACRAMENTO (building). 1700 tons. Dimensions: 210 × 40¾ × 11½ feet.
Guns: 3—4 inch, 2—3 pdr. S.A., 2—1 pdr. Speed, 16 kts.

50 + 12 U. S. DESTROYERS.

No.	Type	Date	Displacement	H.P.	Des. speed	Fuel average	Complement	T. tubes	Mean draug't
			tons average		kts.	tons			feet
6	*new*	'13-'15	1100	...	29½	...	...	...	...
6	*Cushing*	'13-'15	1040	16,000	29	309	98	8	9′ 5″
8	*Alwyn* (turbine)	'12-'14			29	306	98	8	9′ 4″
6	*Paulding*	'10-'12	742	12,000	29½	90—225	79	6	8′ 4″
10		'08-'10							
5	*J. B. Smith* (turbine)	'07-'09	700	10,000	28	90—234	83	3	8′ 0″
9	*Bainbridge*	'00-'02	420	8000	29	139	72	2	6′ 6″
3	*Truxton*	'00-'02	433	8300	30	202	75	2	6′ 0″
2	*Hull*	'00-'02	408	7200	29	150	75	2	6′ 0″
2	*Lawrence*	'99-'01	400	8400	30	123	75	2	6′ 2″

Note.—All armed with 4—4 inch, 50 cal., 8—21 inch tubes (in pairs). Dimensions: *about* 310×30½×9¼ feet. Average displacement: 1100 tons. Designed speed: 29·5.

1 *Bath I.W.*
2 *Cramp.*
1 *Fore River Co.*
2 *New York Shipbuilding.*

CUSHING class (6).

Note.—All armed with 4—4 inch, 50 cal., 8—18 inch tubes (twins). Oil in all, 309 tons. Dimensions: 300 (*w.l.*) ×30½×9′ 5″ (*mean*).

4 funnels, 2 masts. Building authorised, 1912. Laid down, 1913.

1 *Bath I.W.* **McDougal.** 1025 tons.
3 *Cramp.* **Nicholson, O'Brien, Winslow.** 1052 tons.
1 *Fore River.* **Cushing.** 1050 tons.
1 *New York Shipbuilding.* **Ericsson.** 1090 tons.

ALWYN class (8).

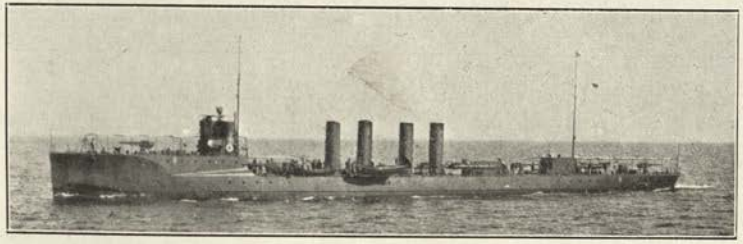
Note.—In all: armament 4—4 inch, 50 cal., 8—18 inch tubes (pairs). Oil fuel. Dimensions: *about* 300 (*w.l.*) × 30½ × 9′ 4″ (*mean*). Nominal radii: 1000 at 30 kts., 4000 at 15 kts., 6000 at 10 kts.

Will have 4 funnels, 2 masts. *Building.* Laid down, 1912.

2 *Bath I.W.* **Cassin, Cummings** (1913). 1020 tons. Machinery: Parsons and reciprocating. Oil: 336 tons. Heating surface, 21,509 sq. feet. Boilers: 4 Normand.
4 *Cramp.* **Alwyn, Balch, Benham, Parker** (—1913). 1036 tons. Machinery: Cramp. Zoelly turbines. Oil: 352 tons. Heating surface, 21,600 sq. feet. Boilers: 4 White-Forster.
1 *Fore River.* **Duncan** (1913) 1014 tons. Machinery: Curtis and reciprocating. Oil: 330 tons. Heating surface 21,500 sq. feet. Boilers: 4 Yarrow.
1 *New York Shipbuilding.* **Downes** (1913) 1072 tons. Machinery: Curtis and reciprocating. Oil: 388 tons Heating surface, 26,456 sq. feet. Boilers: 4 Thornycroft.

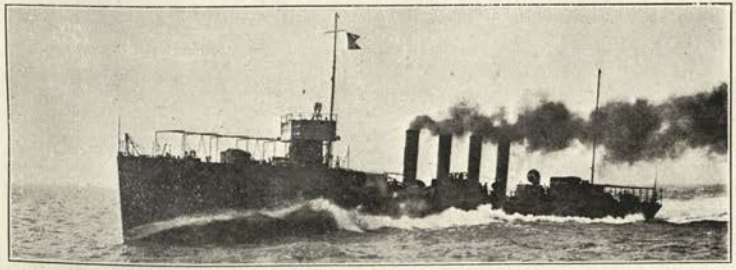
PAULDING class **(21).**

All 742 tons (883 *full load*). Dimensions: 289 (*w.l.*) × 26 × 8¼ (*mean*). Armament: 5—3 inch, 50 cal., 6—18 inch tubes (in pairs).



Photo, Müller

Trials: *Drayton*, 30·83; *Jouett*, 32·27; *Jenkins*, 31·27; *Paulding*, 32·80; *Trippe*, 30·89 kts.



Photo, Müller.

4 *New York Shipbuilding.* ***Ammen*** (1911), ***Burrows*** (1910), ***Jarvis*** (1912), ***McCall*** (1910). Parsons turbine. 3 screws. Machinery averages 280 tons. Boilers: 4 Thornycroft. Oil fuel, 227 tons in *Ammen* and *Jarvis*, 235 in other two. Trials: *Ammen*, 30·48; *Burrows*, ——; *Jarvis*, 30·01; *McCall*, 30·66 kts.

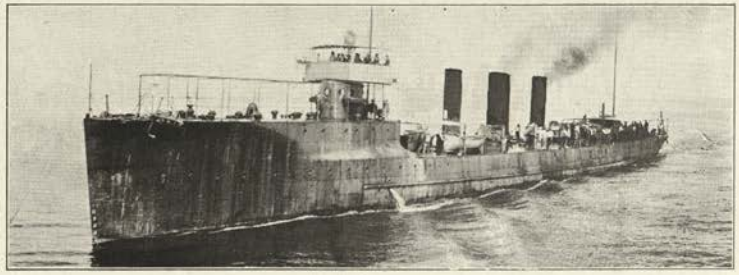


Photo by favour of Lieut. Comdr. H. C. Woodward, U.S.N.

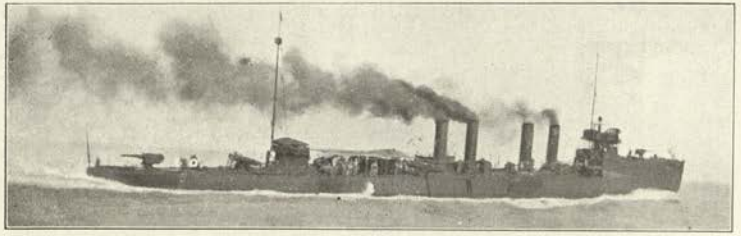
4 *Cramp.* ***Beale*** (1912), ***Mayrant*** (1910), ***Patterson*** (1911), ***Warrington*** (1910). *Mayrant* and *Warrington* have Zoelly turbines. 2 screws. Weight of machinery, 284 tons. Oil, 246 tons. Boilers: 4 White-Forster. *Beale* and *Patterson* have Parsons turbines. 3 screws. Machinery, 273 tons. Oil fuel, 239 tons. Boilers: 4 White-Forster. Trials: *Beale*, 29·65; *Mayrant*, 30·22; *Patterson*, 29·69; *Warrington*, 30·12 kts.

4 *Fore River.* ***Henley*** (1912), ***Perkins*** (1910), ***Sterrett*** (1910), ***Walke*** (1911). *Henley* has Curtis turbines and reciprocating (285 tons), other three Curtis turbines only (300 tons). 2 screws. Boilers: 4 Yarrow. Oil fuel, 247 tons. Trials: *Henley*, 29·50; *Perkins*, 29·76; *Sterrett*, 30·37; *Walke*, 29·76 kts.

4 *Newport News.* ***Fanning*** (1912), ***Monaghan*** (1911), ***Roe*** (1910), ***Terry*** (1910). Parsons turbines, 3 screws. Machinery, 276 tons. Boilers: 4 Thornycroft. Oil fuel: 225 in *Fanning*, 234 in other three. Trials: *Fanning*, 29·99; *Monaghan*, 30·15; *Roe*, 29·60; *Terry*, 30·24 kts.

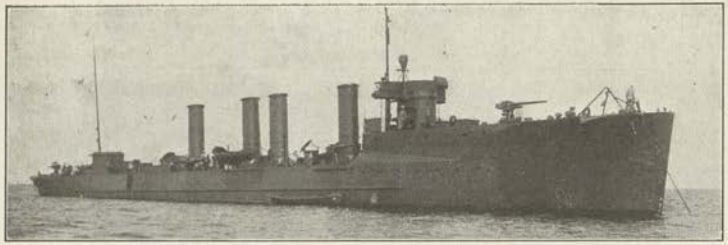
FLUSSER class **(5).**

All 700 tons (*full load*, 902 tons). Dimensions: 289 (*w.l.*) × 26 × 8 (*mean*). Armament: 5—3 inch, 50 cal., 3—18 inch tubes.

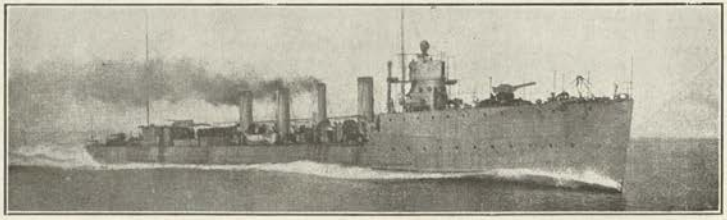


Photo, Commander Williams, U.S.N.

2 *Bath I.W.* ***Flusser*** (1910), ***Reid*** (1910). Parsons turbines. 3 screws. Machinery, 228 tons. Boilers: 4 Normand. Coal: 316 tons. Trials: *Flusser*, 30·41; Reid, 31·82 kts.



2 *Cramp.* ***Lamson*** (1910), ***Smith*** (1910). Parsons turbine. 3 screws. Machinery: 250 tons. Boilers: 4 Mosher. Coal: *Lamson*, 284 tons; *Smith*, 298. Trials: *Lamson*, 32·27; *Smith*, 28·35 kts.

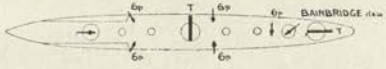


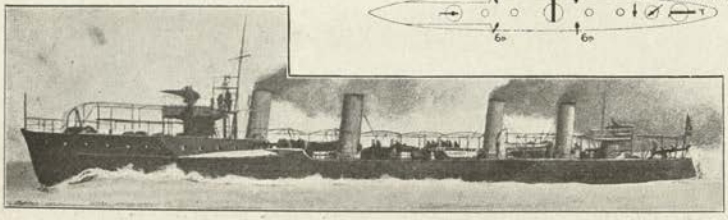
1 *New York Shipbuilding.* ***Preston*** (1910). Parsons turbines. 3 screws. Machinery: 255 tons. Boilers: 4 Thornycroft. Coal: 283 tons.

Old Destroyers.

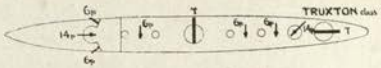
BAINBRIDGE class (9).

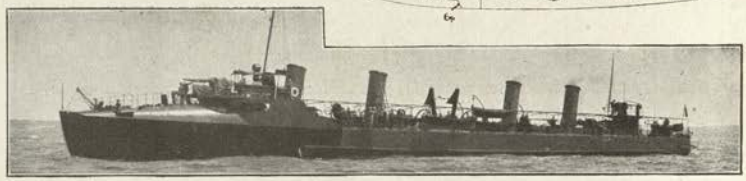
420 tons (*full load* 592 tons). Dimensions: 245 (*o.l.*) × 23 × 6¼ feet (*mean*). Armament: 2—3 inch, 5—6 pdr., 2—18 inch tubes.



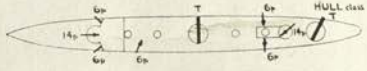


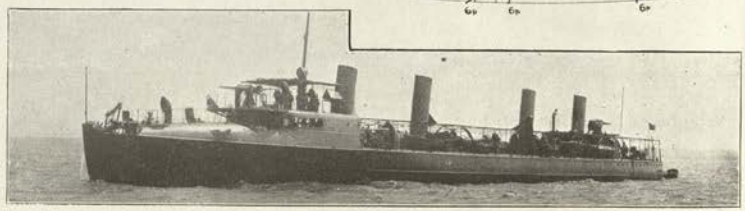
1 *Gas Engine Co.* ***Stewart*** (1902). Machinery, 205 tons. Boilers: 4 Seabury. Coal, 184 tons. Trial speed: 29·69 kts.
3 *Neafie and Levy.* ***Bainbridge*** (1901), ***Barry*** (1902), ***Chauncey*** (1901). Machinery, 209 tons. Boilers: 4 Thornycroft. Coal: 181 tons. Trials: *Bainbridge*, 28·45; *Barry*, 28·13; *Chauncey*, 28·64 kts.
2 *Trigg.* ***Dale*** (1900), ***Decatur*** (1900). Machinery, 204 tons. Boilers: 4 Thornycroft. Coal: 186 tons. Trials: *Dale*, 28; *Decatur*, 28·10 kts.
3 *Union Iron Works.* ***Paul Jones*** (1902), ***Perry*** (1900), ***Preble*** (1901). Machinery, 206 tons. Boilers: 4 Thornycroft. Coal: 179 tons. Trials: *Paul Jones*, 28·91; *Perry*, 28·32; *Preble*, 28·03 kts.





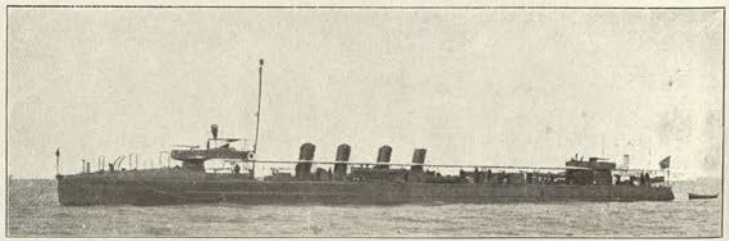
3 *Truxton class:*—***Truxton*** (1901), ***Whipple*** (1902), ***Worden*** (1902). 486 tons. H.P. 8300 = 29 kts. Armament: 2—3 inch (fore and aft), 6—6 pdr. 2—18 inch tubes. Coal: 173 tons. Complement 75.





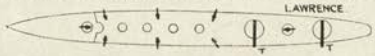
(4 funnels—like Truxton's, but higher).

Hull class:—***Hopkins*** (1901) and ***Hull*** (1902). 408 tons. H.P. 8456 = 29 kts. Armament: 2—3 inch, 5—6 pdrs. 2—18 inch tubes (amidships and aft). Coal: 150 tons. Complement 64.



2 *Lawrence class:*—***Lawrence*** (1900), ***Macdonough*** (1900). 400 tons. H.P. 8400 = 30 kts. Armament: 7—6 pdr. 2—18 inch tubes. Coal: 123 tons. Complement 75.

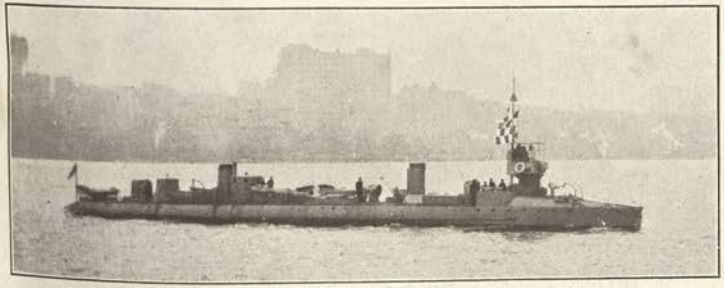
General Note.—*Lawrence* is the worst of the lot; but all are good sea boats. None of these older boats can maintain more than 25 kts.



19 + 4 (*Subsidiary*) Torpedo Boats.

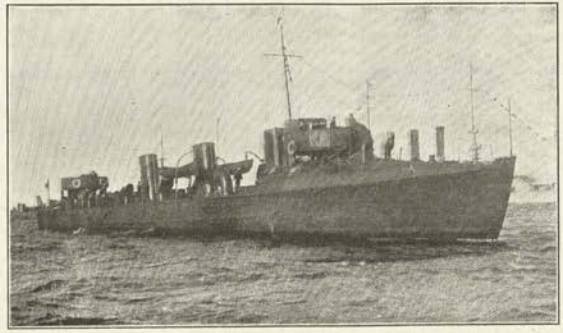
No.	Type.	Date.	Displacement.	H.P.	*Max.* speed.	Fuel.	Complement.	T. Tubes.	*Max.* draug't
	1st Class					tons			
3	*Barney*	'01-'00	175	3920	28·5	40/80	27	3	..
7	*Shubrick*	'02-'99	196	3000	26	40/72	29	3	...
1	*Stringham*	'99	340	7200	30†	96/120	55	2	...
1	*Goldsborough*	'99	255	6000	30†	—/80	61	2	...
1	*Farragut*	'98	273	5600	30	44/95	62	2	...
1	*Bailey*	'99	280	5600	30	50/99	57	2	..
2	*Dahlgren*	'96	146	4200	22·5	32	26	2	...
1	*Dupont*	'95-'96	165	3800	28	*max.* 60	25	3	...
2	*Morris*	'96	105	1750	24	*max.* 28	24	3	...
	2nd Class								
1	*Mackenzie*	'96	65	850	20	15	16	2	6
	3rd Class								
1	*Gwin*	'98-'96	46	850	20	9	16	2	4½

3 others assigned to Naval Militia, and one to special service. † Nominal only: never made.

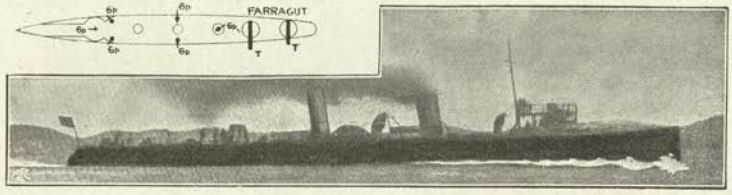


3 *Barney class* (Built by Bath Ironworks):—**Barney** ('00), **Biddle** ('01), **Bagley** ('00). 175 tons. Designed H.P. 3920=28·5 kts. Normand boilers. Armament: 3—3 pdr., 3—18 inch tubes (one amidship, one abaft funnels, one aft). Coal: 43 tons. Complement 27. *Max.* draft: about 6 feet.

7 *Shubrick class*:—**Shubrick** ('99), **Thornton** ('00) **Stockton** ('99) (Built by Trigg), **De Long** ('00), **Blakely** ('00) (Built by Lawley, Boston), **Wilkes** ('01) (Gas Engine Co. and Seabury), and **Tingey** ('02) (Columbian Ironworks). 196 tons. H.P. 3000=26 kts. (*Shubrick* did 28 on trial). Thornycroft boilers (except *Wilkes*, which has Seabury). Armament: 3—1 pdr. 3—18 inch tubes (two of them between funnels, the other right aft). Coal: *max.* 72 tons. Complement, 29. *Max.* draught: about 6 feet.



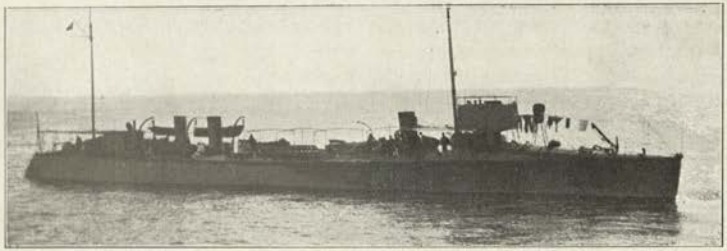
1 **Stringham** ('99) (Built by Harland & Hollingsworth). 340 tons. Designed H.P. 7200=30 kts. (*nominal*). Boilers: Thornycroft. Armament: 4—6 pdrs. S.A. 2—18 inch tubes (aft). Coal: 96 tons; *max.* 120 tons. *Max.* draught: 8 feet. *Mean* draught: 6 feet. Complement, 55. Never made designed speed. Best actual 25.53.



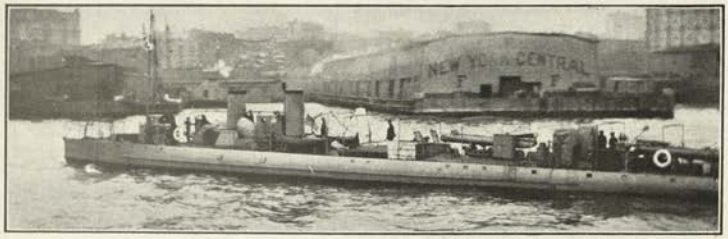
1 **Farragut** ('98) (Union Ironworks). 273 tons. H.P. 5600=30 kts. (made 31·7 on trial). Thornycroft boilers. Armament: 4—6 pdr. 2—18 inch tubes (aft). Coal: 95 tons. Complement, 62.

1 **Goldsborough** ('99) (Wolff & Zwicker). 245 tons. Designed H.P. 6000=30 kts. (*nominal* never made). Thornycroft boilers. Armament 4—6 pdr. 2—18 inch tubes (aft). Coal: *max.* 131 tons. Re-engined 1905. Complement, 61.

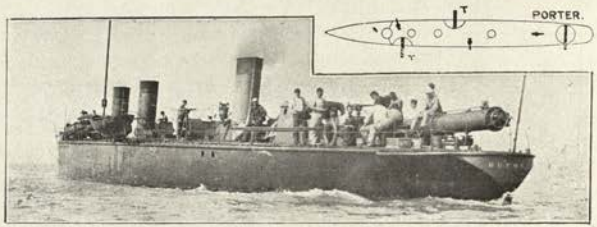
U. S. TORPEDO BOATS.



1 ***Bailey*** ('99) (Built by Gas Engine Co. and Seabury). 280 tons. H.P. 5600=30 kts. Seabury boilers. Armament: 4–6 pdr. S.A. 2–18 inch tubes. Coal: 99 tons. Complement, 57.

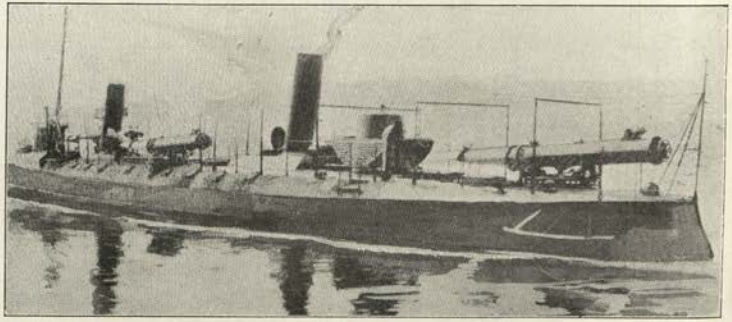


2 *Dahlgren class*:—***Dahlgren*** ('96) (T.A.M.), ***Craven*** ('96) (Built at Bath Ironworks). 146 tons. Designed H.P. 4200=22·5 kts. Normand boilers. Armament: 4—1 pdr., 2—18 inch tubes (single) aft. Coal: 32 tons. Complement, 26.



1 ***Dupont*** ('96) (Built by Herreshoff Co.). 165 tons. Designed H.P. 3800=27·5 kts. (did over 28 on trial). Boilers: 3 Normand. Armament: 4—1 pdr., 3—18 inch tubes. Coal: 76 tons. Complement 30.

MORRIS. *(see below)*.



DAVIS.

Morris type:—***Morris*** ('96). 105 tons. (Herreshoff Co.). ***Davis*** ('98). 154 tons. Designed H.P. 1750=22·5 kts. (23·54 trial). Boilers: 2 Thornycroft, except *Morris*, 2 Normand. Armament: 3—1 pdr., 3—18 inch tubes. Coal: *max.* 40 tons. Complement, 27.

39 + 8 Submarines (others *pro.*)

No.	Type	Date	Displacement	H.P. Surface	*Max.* speed	Fuel	Complement	T. Tubes	*Max.* draug't
			tons		kts.				feet
4	*new* boats	'14-'16	710	...	...	...	...	...	...
1	M 1 (H)	'13-'15	...	...	...	...	...	...	...
7	L 5—7 (L)	'13-'15	515	...	...	For 4500 at 11 kts.	...	...	15
	L 1—4 (H)	'13-'15	...	...	...	...	...	...	...
8	K 1—K 8 (H)	'12-'13	390 / 520	950	14·5 / 10·5	For 2500 at 11 kts.		...	...
3	H 1—H 3 (H)	'11-'13	430	800	14 / 11	For 2500 at 11 kts.	...	4	...
1	G 4 (Li)	'11-'12	358 / 458	1000	14 / 9·5	Surface for 1680 at 8 kts. 40 at 5 kts.	...	4	...
3	G 1—G3 (L)	'10-'11	540	1200	14 / 10	...	...	6	...
4	F 1—F 4 (H)	'10-'11	350 / 430	...	14 / 9·5	For 2500 at 11 kts.	...	2	...
2	E 1, E 2 (H)	1910	359 / 430	...	14 / 11	Petrol for 2500 at 11 kts.	...	2	...
3	D 1—D 3 (H)	1909	280 / 345	600	13 / 9	Petrol	15	2	14¾
5	C 1—C 5 (H)	1909	238 / 275	500	11 / 10	For 1050 surface 60 kts. sub.	10	2	14¾
3	B 1—B 3 (H)	'06-'07	170	250	9½ / 8½	Petrol for 1000 kts.	10	2	13
7	A 1—A 7 (H)	'01-'03	120	160	9 / 7	Petrol for 400 kts.	7	1	12

(H) = Holland. (L) = Lake. (Li) = Laurenti.

Building.

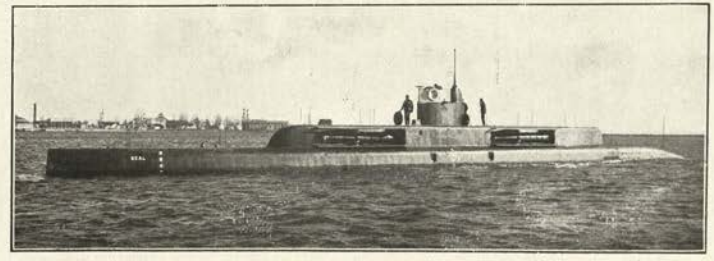
K 1–K 8 (1912-13). Dimensions: 148 × 15½ × 15 feet. Radius: 4500 at 11 kts. surface. 120 at 5 kts. submerged.

Completing.

H 1–H 3. Radii: 2500 at 11 kts. surface. 100 at 5 kts. submerged.

Photo, Müller.

G 4 (1912). Dimensions: 157½ × 17½ feet. Armament: 4—18 inch tubes. H.P. $\frac{1000}{440} = \frac{14}{9·5}$ Radius: 12 hours submerged. Fitted with a 10 ton drop keel.

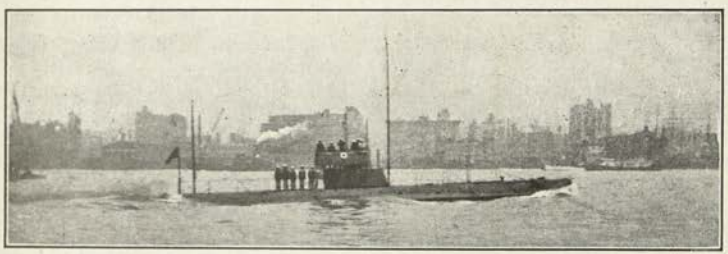


G 1–G 3.

U. S. SUBMARINES.

No photo available.

F1—F4. Radii 2500 at 11 kts. surface, 100 at 5 kts. submerged.

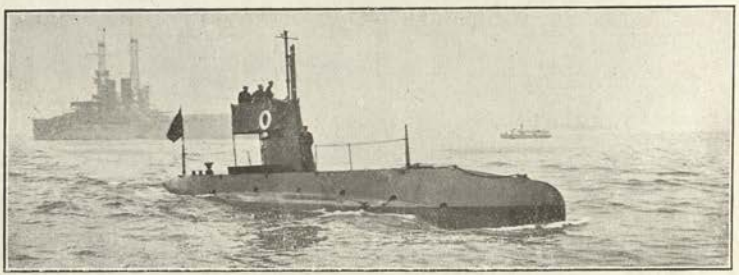


E1, E2. Radii, 2500 at 11 kts. surface, 100 at 5 kts. submerged.

Photo, H. Reuterdahl, Esq.

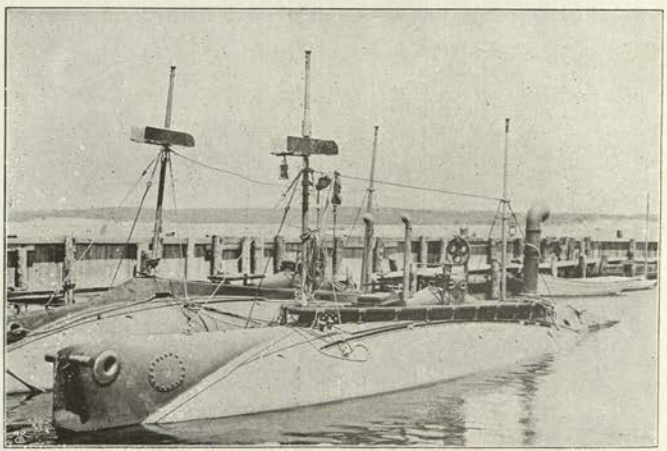
Photo, Boston News Co.

D1—D3. Dimensions: 134½ × 14 × 14½ feet.



C1—C5. Nominal radius, 900 at 9 kts. surface, 80 at 5 kts. submerged.
B1—B3. Radii about same as *C* class.

Photo, Müller.



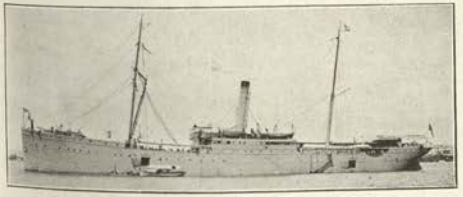
A1—A7. Radii, 300 at 8·5 kts. surface, 28 at 7 kts. submerged. Dimensions: 63½ × 12 × 12 feet.

Tenders to Destroyers.

MELVILLE (*building*), 6300 tons. (Authorised 1912.)

DIXIE (*ex El Sud*), (1893). 6114 tons. Armament: 10—3 inch, 2—6 pdr. H.P. 3800=14·5 kts. Coal: 1375 tons. (Mother ship, Atlantic Torpedo Flotilla.)

POMPEY (1888). 3085 tons. No guns. Speed: 10·5 kts. Coal: 200 tons.



Photo, Müller.

IRIS (1885). 6100 tons. No guns. Speed: 10 kts. Coal: 300 tons.

Tenders to Submarines.

(Authorised 1912).

BUSHNELL (*building*). 3600 tons. 14 kts.

One funnel. Two schooner masts
(Authorised 1911)

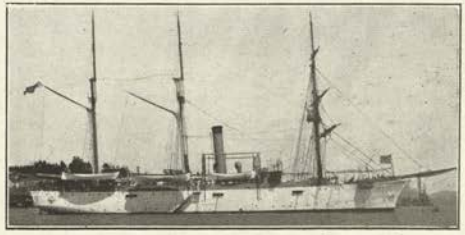
FULTON (*building*). 1408 tons. Guns: 4—3 inch R.F. Designed speed: 12·25 kts. Coal: 234 tons.

CASTINE (1891). 1177 tons. Guns: 2—6 pdr. R.F. Speed: 16 kts. Coal: 210 tons.

Tenders to Submarines (*continued*).

Old three masted ship, top masts removed.

SEVERN (1899). 1175 tons. No guns. Coal: 43 tons.



ALERT (1875). 1100 tons. Guns: 6—4 inch, 40 cal., 4—6 pdr. Speed: 10 kts. Coal: 197 tons.

One funnel. 3 masts (Barque rig).

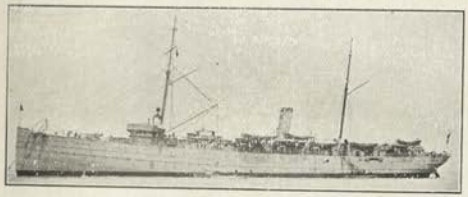
MOHICAN (1873). 1900 tons. Guns: 4—6 pdr. R.F. I.H.P. 1150. Coal: 158 tons.

U. S. MISCELLANEOUS.

Transports. (5)

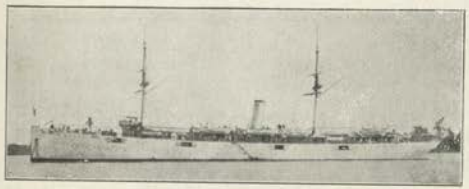
One funnel. 2 masts (schooner rig).

GENERAL ALAVA (1895). 1115 tons. Guns: 2—6 pdr. Speed: 10·5 kts. Coal: 240 tons.



Photo, Müller

BUFFALO (*ex El Cid*), (1892). 6900 tons. Armament: 2—5 inch, 4—4 inch, 6—3 pdr. H.P. 3600 = 14·5 kts. Coal: 1300 tons.



PRAIRIE (*ex El Sol*), (1890). 6620 tons. Armament: 10—3 inch. H.P. 3800 = 14·5 kts. Coal: 1000 tons.

Transports (*continued*).

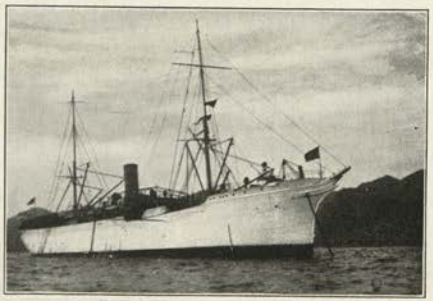
Photo, P. A. Surgeon R. B. Henry, U.S.N.

RAINBOW (1890). 4360 tons. Guns: 6—6 pdr., 6—1 pdr. Speed: 12 kts. Coal: 1139 tons.

One very big funnel. 4 masts (schooner rig).

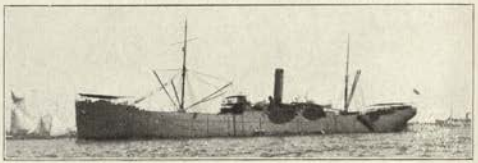
HANCOCK (1879). 8500 tons. Guns: 2—6 pdr. Speed: Coal: 2428 tons.

Supply Ships. (4)



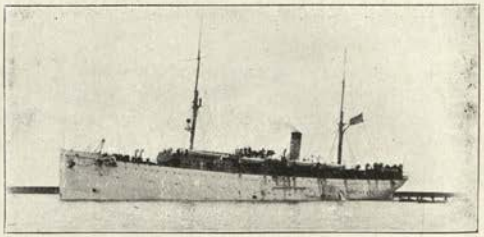
GLACIER (1891). 8325 tons. Guns: 1—3 pdr. Speed, 12·5 kts.

Supply Ships.



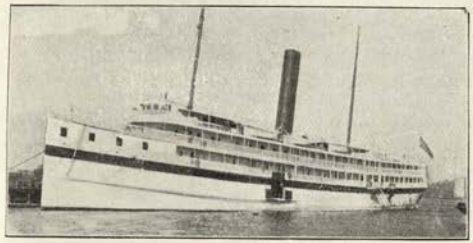
CELTIC (1891). 8000 tons. Speed, 10·5 kts. (Armed with 2—6 pdr.)

CULGOA (1889). 6100 tons Speed, 12·5 kts. (Armed with 2—6 pdr.)

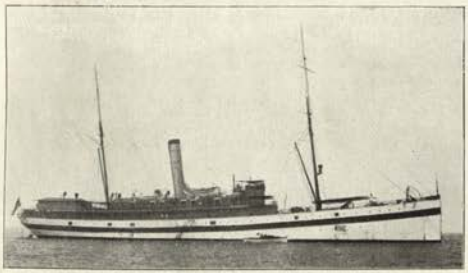


SUPPLY (1873). 4325 tons. Armament: 6—6 pdr., 4—1 pdr. Speed, 9 kts.

Hospital Ships. (2)



RELIEF (1903). 3300 tons. Speed: 15 kts. Armament: *Nil.*



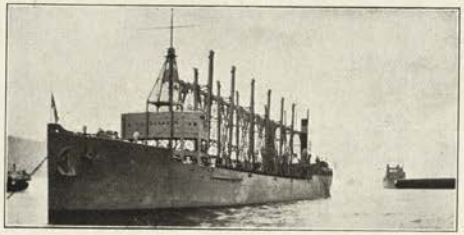
SOLACE (1896). 3300 tons. Speed: 15 kts. Armament: *Nil.*

Fuel Ships.

Building.

KANAWA & MAUMEE (building). 14,500 tons. 14 kts. Own fuel: 1568 tons. Cargo: oil only, 7554 tons.

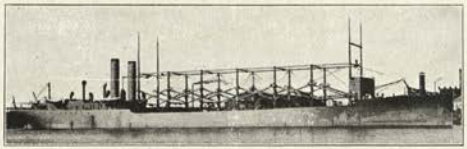
Fuel Ships—*Continued.*



JASON (1912), **ORION** (1912). 19,132 tons. 14 kts. Own coal, 2000 tons. Cargo: 10,500 tons coal, 2586 tons oil.

NEREUS (1913), **PROTEUS** (1912). 19,000 tons. 14 kts. Own coal, 2000 tons. Cargo: 10,500 tons coal, 3081 oil.

NEPTUNE (1911). 19,375 tons. 14 kts. Own coal, 2000. Cargo: 10,500 tons coal, 2929 oil.



CYCLOPS (1910), **JUPITER** (1912). 19,360 tons. 14 kts. Own coal, 2233 & 2043 tons. Cargo: 10,457 tons coal, 2923 oil.

HECTOR (1909), **MARS** (1909), **VULCAN** (1909). 11,230 tons. Speeds about 12½ kts. Own coal, 818 tons. Cargo, coal only, *maximum* 8128 tons.

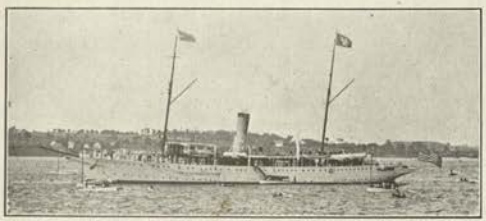
Fuel Ships—*Continued.*

PROMETHEUS (1908). 12585 tons. Speed 16 kts. Own coal, 1576 tons. Cargo: coal only, 5600-6410 tons. Babcock boilers. (There are 12 other ordinary Colliers).

U. S. CONVERTED YACHTS.

EAGLE (1890) 434 tons. Armament: 2—6 pdr. H.P. 850 = 15·5 kts. Coal: 65 tons. Complement, 64.

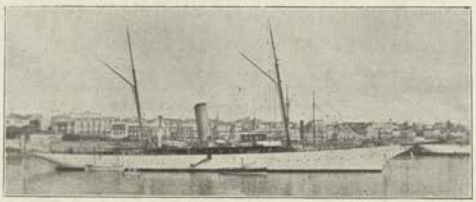
(*Surveying.*)



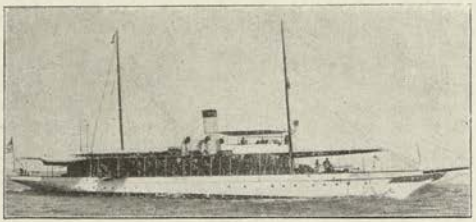
Photo, Lieut. F. S. Dowell, U.S.N.

MAYFLOWER (1896). 2690 tons. Armament: 6—6 pdr. H.P. 4700 = 16·81 kts. Coal: 525 tons. Complement, 166.

(*Presidential Yacht.*)



SCORPION (1896). 775 tons. Armament: 4—6 pdr. H.P. 2800 = 17·75 kts. Coal: 133 tons. Complement, 80.



SYLPH (1898). 152 tons. Armament: none. H.P. 550 = 15 kts. Coal: 50 tons. Complement, 27.

YANKTON (1893). 975 tons. Armament: 4—3 inch. H.P. 750 = 14 kts. Coal: 170 tons. Complement, 95. 1″ deck amidships.

Photo, Müller.

RESTLESS (1887). Dimensions: 113 × 16 × 6½ feet. Speed: 13 kts. Coal: 12 tons. Guns: 1—1 pdr.

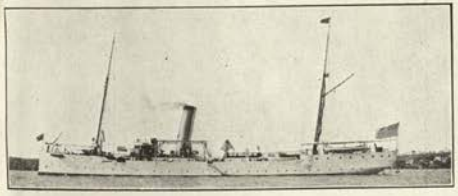
(*Experimental Mine School Ship.* Torpedo Station: Newport.)

Tugs.

Photo, Müller.

SONOMA (1912), & **ONTARIO** (1912). 1120 tons. Dimensions: 175 (*p.p.*) × 34 × 12½ ft. (*mean*). Speed: 13 kts. Coal: 462 tons. (There are 44 ordinary tugs. The above two are ocean-going, and available as repair ships).

Special Type.



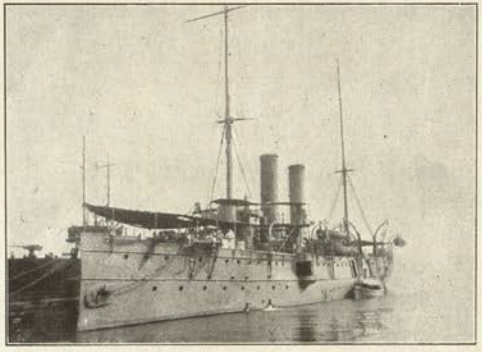
Taken June, 1914. *Photo by favour of Lt. Com. Earle, U.S.N.*

DOLPHIN (1885). 1486 tons. Guns: 6—6 pdr. H.P. 2253 = 13½ kts. Boilers: 4 Scotch. Coal: 255 tons. Complement, 141.

Special Type.

Photo, H. Reuterdahl, Esq.

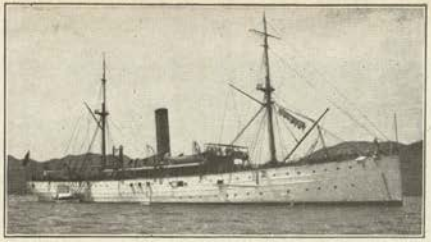
LEBANON ( ). 3285 tons. Guns: 2—6 pdr. Speed: 10 kts. Coal: 188 tons. Complement, 56.



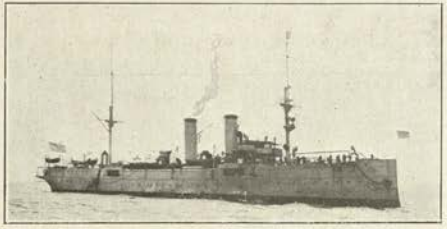
MONTGOMERY (Torpedo Exp. Ship). Guns: 2—6 pdr. Tubes: 1—21 inch *sub.*, 1—18 inch *sub.*, 1—18 inch, 1—21 inch *above water*.

Photo by Lieut. Bass, U.S.N.

VESTAL (1908). 12,565 tons. No guns. Speed: 16 kts. Coal: 1648 tons. Babcock boilers.



PANTHER (1898). 3380 tons. Speed, 13·5 kts. Coal, 675 tons. (Armed with 2—6 pdr.)

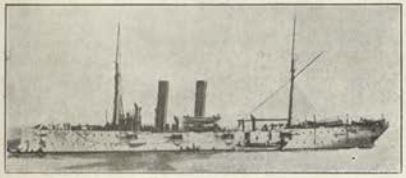


SAN FRANCISCO (1889). Displacement 4098 tons. Armament: 8—5 inch, 2—6 pdr., saluting. Carries 300 Mark II. mines. 4 searchlights. Designed H.P. 8500 = 19 kts. Babcock boilers, new 1911. Coal: *normal* 400 tons; *maximum* 809 tons.

VESUVIUS (1887). Armament: 1—3 pdr. saluting. Torpedo tubes: 1—21 inch *sub.*, 1—18 inch *sub.*, 2—18 inch *above water*. (*Experimental Torpedo Ship.*)

U. S. NAVAL MILITIA.

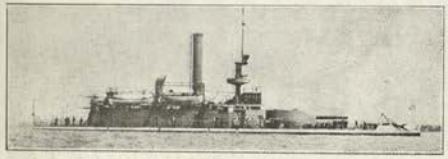
California.



Photo, Müller

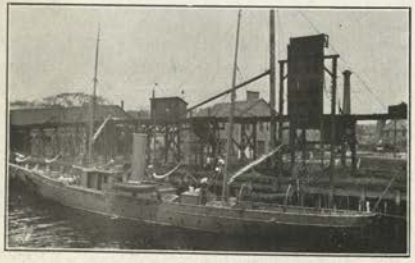
MARBLEHEAD (1892). 2212 tons. Guns: 8—5 inch, 2—6 pdr., *also temporarily* 2—4 inch, 40 cal., 2—3 pdr. Designed H.P. 5100=17 kts. Coal: 346 tons. Complement, 270.

Columbia. (District of)



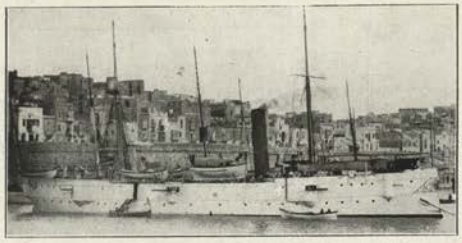
OZARK (1900). 3235 tons. Guns: 2—12 ins., 40 cal., 4—4 ins., 3—6 pdr. Armour: Krupp, 11″ belt and turret. H.P. 2400=12 kts. Coal: *Maximum* 400 tons. Complement, 222.

Note.—Now serving as submarine tender, Atlantic Fleet.



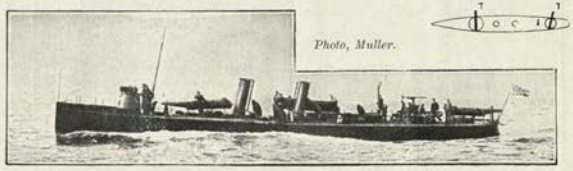
ONEIDA (1896) 150 tons. Guns: 1—3 pdr., 2—1 pdr. H.P. 350=12 kts. Coal: 20 tons. Complement, 24.

Connecticut.



MACHIAS (1891). 1848 tons. Guns: 8—4 inch, 2—6 pdr., 2—3 pdr., 2—1 pdr., 2 machine. H.P. 2000=14·5 kts. Normand and cylindrical boilers. Coal: 292 tons. Complement, 138.

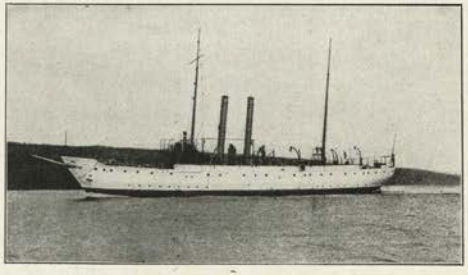
Florida.



Photo, Muller.

MACKENZIE t.b.d.' ,1—1 pdr., 2—18 inch tubes.

Illinois.



DUBUQUE (1904). 1085 tons. Guns: 6—4 inch, 40 cal., 4—6 pdr., 2—1 pdr. H.P. 1000=12·9 kts. Coal: *Maximum*, 246 tons. Babcock boilers. Complement, 154.

Indiana.

(*None at present*).

Louisiana.

AMPHITRITE (1883). 3990 tons. Guns: 4—10 inch, 2—4 inch, 2—3 pdr., 2—1 pdr. Armour: Iron belt 9″, steel turrets 11½″—7½″, speed: 10·5 kts. Coal: 271 tons.

Ex Yacht. Schooner rig.

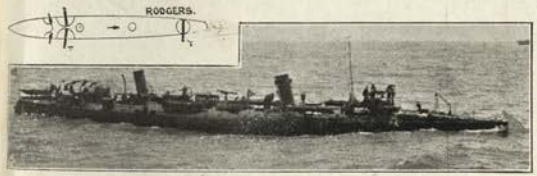
STRANGER (1880). 369 tons. Guns: 2—3 pdr. H.P. 920=14 kts. Coal: 50 tons.

Maine.

(*None at present*).

Massachusetts.

CHICAGO (1885). Displacement, 5000 tons. Armament: 4—8 inch, 35 cal., 6—5 inch, 40 cal. 6—4 inch, 40 cal., 7—6 pdr., 2—3 pdr., 2—1 pdr. Designed H.P. 10,000 = 18 kts. Boilers: 6 Babcock and 4 cylindrical. Present speed under 16 kts. Coal: 850 tons

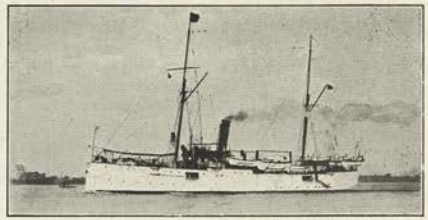


RODGERS (torpedo boat). 142 tons. 3—1 pdr., H.P. 2000 = 24 kts. Coal: 44 tons.

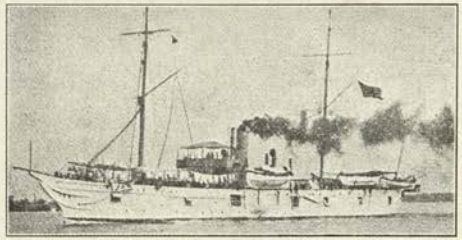
Maryland.

Torpedo boat, **SOMERS.** 150 tons. Guns: 4—1 pdr. H.P. 1900 = 17 kts. Coal: 37 tons.

Michigan.

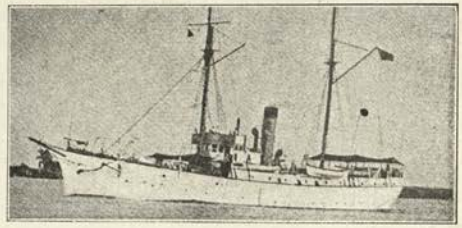


DON JUAN DE AUSTRIA (1887). 1015 tons. Guns: 2—4 inch, 40 cal., 6—6 pdr., 2—3 pdr., 2—1 pdr. H.P. 941 = 12·2 kts. Coal: 204 tons. Complement, 130.



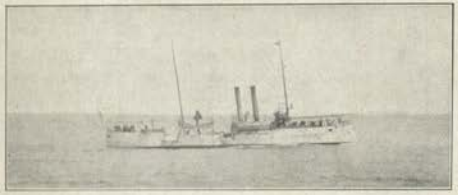
YANTIC (1864). 130 tons. 2—6 pdr., 2—3 pdr. S.A. H.P. 310 = 8·3 kts.

Minnesota.



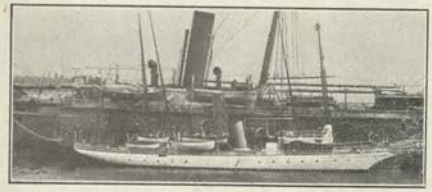
GOPHER (1871). 840 tons. 2—3 pdr. S.A., 2—1 pdr. Speed, 9 kts. Coal: 80 tons.

Missouri.



Photo, H. Reuterdahl, Esq.

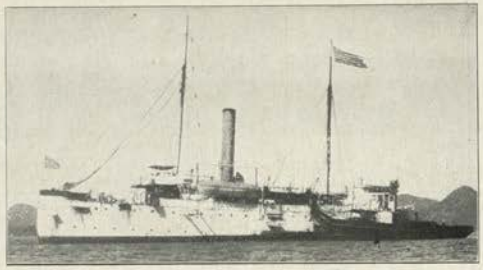
ISLA DE LUZON (1886 *ex Spanish*). 1030 tons. Guns: 4—4 inch, 4—6 pdr., 2—3 pdr., 2—1 pdr. H.P. 1000=14 kts. Coal: 159 tons. Babcock boilers (1911).



Photo, Müller.

HUNTRESS (1895). 82 tons. Guns: 2—3 pdr., 2—1 pdr. H.P 800=14 kts. Coal: 17 tons. Complement 20.

New Jersey.



MARIETTA (1897). 1000 tons. Guns: 6—4 inch, 4—6 pdr., 2—1 pdr. H.P. 1250=13 kts. Babcock boilers. Coal: 229 tons. Complement 155.

Photo. H. Reuterdahl, Esq.

VIXEN (1896). 806 tons. Guns: 2—6 pdr., 2—3 pdr., 2—1 pdr. H.P. 1250=16 kts. Coal: 190 tons. Complement 74.

New York.

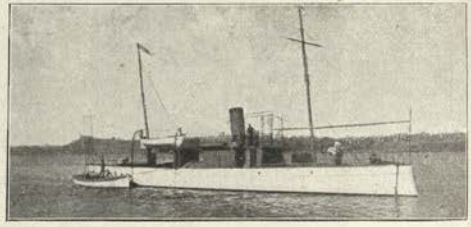
Photo: favour of Commodore R. P. Forekew, N.Y.N.M.

GLOUCESTER (1891). 786 tons. Guns: 3—3 pdr., 4—1 pdr. H.P. 2000=17 kts. Coal: 120 tons. Complement 70. Boilers: Babcock.

New York—*Continued.*

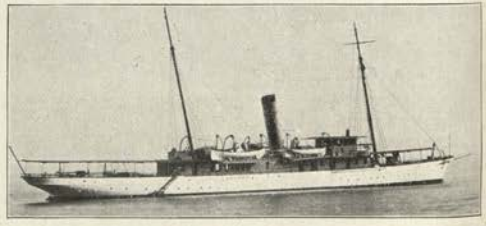
Photo, H. Reuterdahl, Esq.

HAWK (1891). 375 tons. Guns: 1—3 pdr, 1—1 pdr. H.P. 1000=14½ kts. Coal: 70 tons. Complement 46.



Photo, Miller.

SANDOVAL (1895). 100 tons. Guns: 2—3 pdr., 1—1 pdr. H.P. 666=18 kts. Coal: 16 tons. Complement 23.



WASP (1898). 630 tons. Guns: 2—3 pdr., 4—1 pdr. H.P. 1800=16½ kts. Coal: 79 tons. Complement 32.

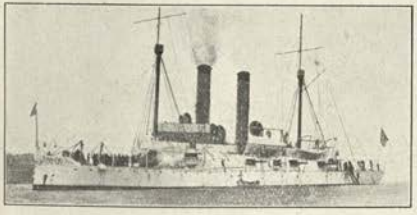
North Carolina.

Photo, Müller.

ELFRIDA (1889). 164 tons. Guns: 1—3 pdr., 2—1 pdr. H.P. 200 = 14 kts.

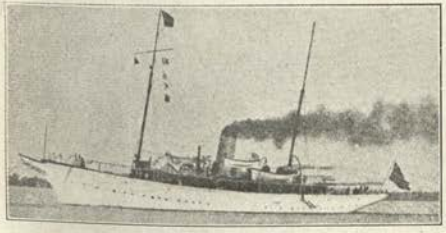
FOOTE. [*Ex, see Rodgers p. 201.*]

Oregon.



BOSTON. 2—8 inch, 30 cal., 3—6 inch, 1—4 inch, 6—6 pdr. 3000 tons.

Ohio.



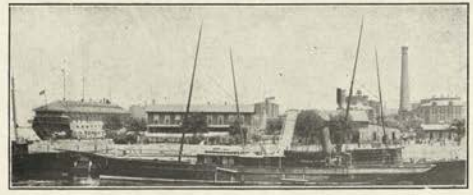
DOROTHEA (1897). 594 tons. Guns: 2—3 pdr., 3—1 pdr. H.P. 1560 = 15 kts. Coal: 78 tons. Complement 50. Boilers: Yarrow.

Ohio—*Continued.*

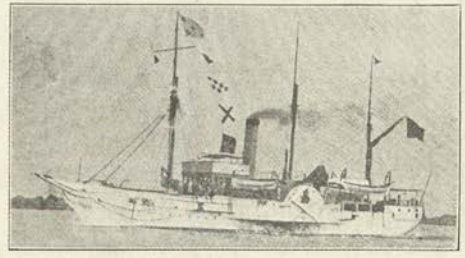
1 funnel. Barque rig. Clipper bow.

ESSEX (1874). 1375 tons Guns: 2—3 pdr., 2—1 pdr., H.P. 800 = 12 kts. Coal: 155 tons. Complement 207.

Pennsylvania.

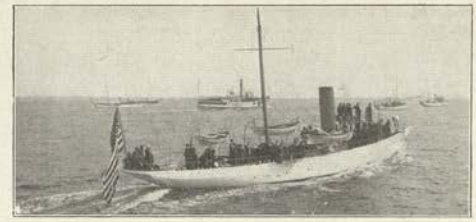


SYLVIA (1882). 302 tons. Guns: 1—6 pdr., 3—1 pdr. H.P. = 9 kts. Coal: 60 tons. Complement 30.



WOLVERINE (1842). 685 tons. H.P. 365 = 10·5 kts. Paddle wheel. Coal: 115 tons. Complement (Navy), 25. Assigned to duty Naval Militia of Great Lakes. Guns: 6—6 pdr.

Rhode Island.



Photo, H. Reuterdahl, Esq.

AILEEN (1896). 192 tons. Guns: 1—3 pdr., 2—1 pdr. H.P. 500 = 14 kts. Coal: 45 tons. Complement 33.

South Carolina.

[*None at present.*

Washington.

CHEYENNE (1900). 3235 tons. Guns: 2—12 inch, 40 cal., 4—4 inch, 3—6 pdr., 4—1 pdr. Armour (Krupp): 11 inch belt and turret. H.P. 2400 = 12 kts. Coal: *maximum*, 400 tons. Comp., 222.

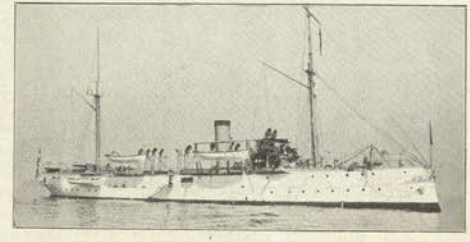
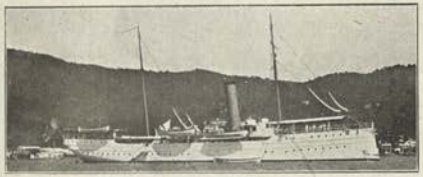


Photo (copyright), Müller.

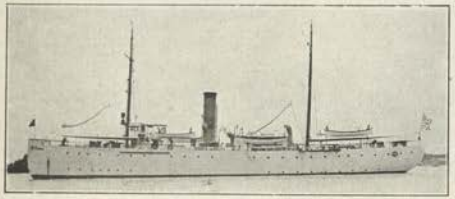
CONCORD (1889). 1720 tons. Guns: 3—6 inch, 30 cal., 1—4 inch, 40 cal., 4—3 pdr, H.P. 3400 = 16·8 kts. Coal: *maximum*, 380 tons. Complement 177.

U. S. REVENUE CUTTER SERVICE.

Note.—These vessels do not belong to the Navy Department but to the Treasury. Most of them are fitted to carry 4 inch guns, and several have fitting for a torpedo tube in the bow. **(Photos and data official.)**

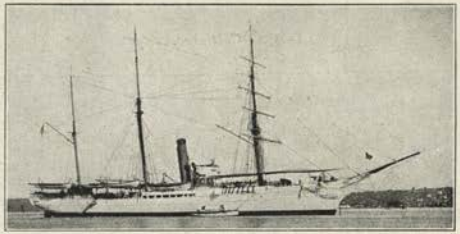


ALGONQUIN (1898). Steel, 1 screw. 936 tons. Dimensions: 205×32×13 feet. 4—6 pdr. *Signal letter:* GVFL. *Headquarters:* San Juan, P.R.

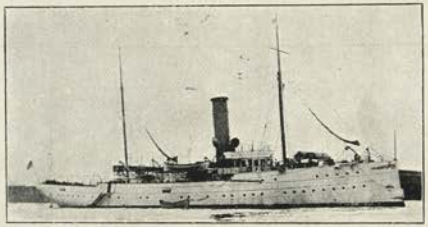


ANDROSCOGGIN (1908). Wood, 1 screw. 1270 tons. Dimensions: 210×35×15 feet. 4—6 pdr. *Sig.:* GVHK. *Headquarters:* Portland, Me.

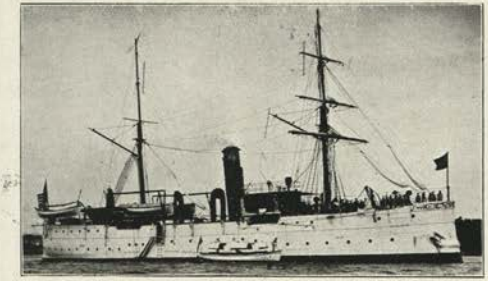
APACHE (1891). Iron, 1 screw. 664 tons. Dimensions: 188×29×8ft. 3—3 pdr. *Sig.:* GVBS. *Headquarters:* Baltimore, Md.



BEAR (1874). Wood, 1 screw. 1200 tons. Dimensions: 198×30×18ft. 3—6 pdr. *Sig.:* GVDM. *Headquarters:* San Diego, Cal.

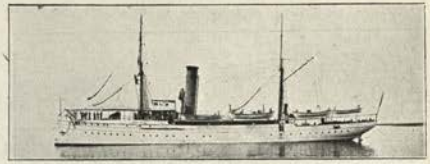


GRESHAM (1897). Steel, 1 screw. 936 tons. Dimensions: 205×32×11 feet. 4—6 pdr. *Sig.:* GVFD. *Headquarters:* Boston, Mass.



Photo, Abrahams.

ITASCA (*ex Bancroft*), (1893). Steel, 2 screws. 839 tons. Dimensions: 189×32×13 feet. 4—6 pdr., 2—3 pdr. *Sig.:* GVHF. *Headquarters:* Arundel Cove, Md.

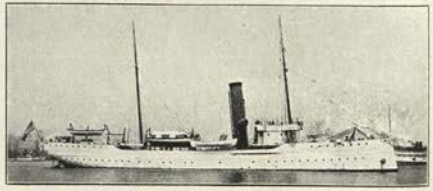


MANNING (1897). Composite, 1 screw. 962 tons. Dimensions: 205×32×13 ft. 4—6 pdr. *Sig.:* GVFK. *Headquarters:* Astoria, Oreg.

McCULLOCH (1898). Composite, 1 screw. 1280 tons. Dimensions: 219×33×15 feet. 4—6 pdr. *Sig.:* GVFJ. *Headquarters:* San Francisco, Cal.

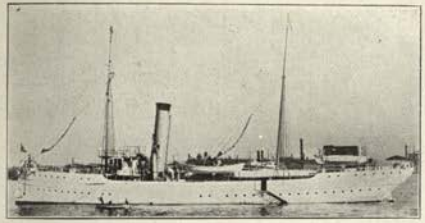
No photo available.

MIAMI (1912). Steel. 1 screw. 1180 tons. Dimensions: 190×32×13 ft. 3—6 pdr. *Headquarters:* Key West, Fla.



MOHAWK (1902). Steel, 1 screw. 980 tons. Dimensions: 205×32×11 feet. 4—6 pdr. *Sig.:* GVFT. *Headquarters:* New York, N.Y.

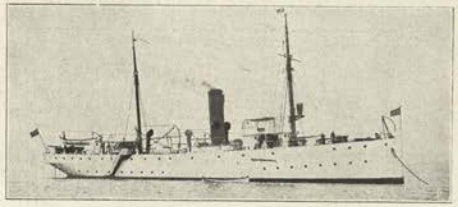
First Class.—*Continued.*



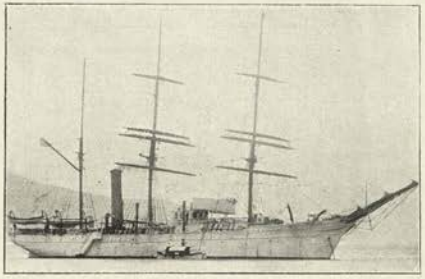
ONONDAGA (1898). Steel, 1 screw. 936 tons. Dimensions: 205×32×13 feet, 4—6 pdr. *Sig.:* GVFM. *Headquarters:* Norfolk, Va.

SEMINOLE (1900). Steel, 1 screw. 785 tons. Dimensions: 188×29×11 feet. 4—6 pdr. *Sig.:* GVFP. *Headquarters:* Wilmington, N.C.

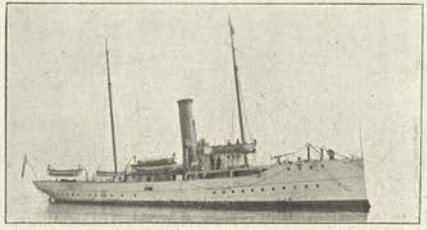
SENECA (1908). Steel, 1 screw. 1480 tons. Dimensions: 204×34×17 feet. 4 guns. *Sig.:* GVHL. *Headquarters:* New York, N.Y. (*Derelict Destroyer.*)



TAHOMA (1909). Steel, 1 screw. 1050 tons. Dimensions: 191×32×14 feet. 4—6 pdr. *Sig.:* GVHQ. *Headquarters:* Seattle, Wash.



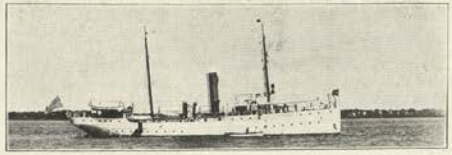
THETIS (1891). Wood, 1 screw. 1200 tons. Dimensions: 188×29×18ft. 3—3 pdr. *Sig.:* GVFQ. *Headquarters:* Honolulu, Hawaii.



TUSCARORA (1902). Steel, 1 screw. 670 tons. Dimensions: 178×30×11 ft. 2—3 pdr. *Sig.:* GVFS. *Headquarters:* Milwaukee, Wis.

No photo available.

UNALGA (1912). Steel. 1 screw. 1180 tons. Dimensions: 190×32×13 feet. 3—6 pdr. *Headquarters:* Juneau, Alaska.



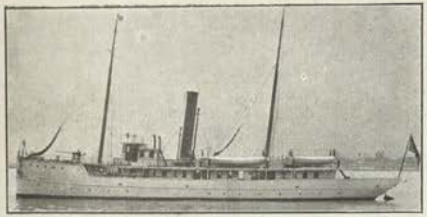
YAMACRAW (1909). Steel, 1 screw. 1006 tons. Dimensions: 191×32×14 feet. 4—6 pdr. *Sig.:* GVHR. *Headquarters:* Savannah, Ga.

First Class Sea-going Tugs.

ACUSHNET. Steel, 1 screw. 769 tons. Dimensions: 152×29×12ft 2—1 pdr. *Sig.:* GVHP. *Headquarters:* Woods Hole, Mass.

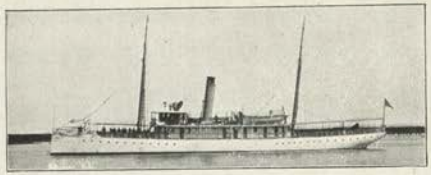
also

SNOHOMISH. Steel, 1 screw. 795 tons. Dimensions: 152×29×15 feet. 2—3 pdr. *Sig.:* GVHN. *Headquarters:* Neah Bay, Wash.

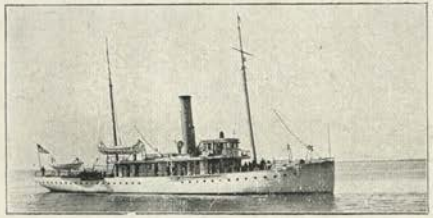


MORRILL (1889). Iron, 1 screw. 397 tons. Dimensions: 145×24×9 ft. 2—3 pdr. *Sig.*: GVDN. *Headquarters:* Detroit, Mich.

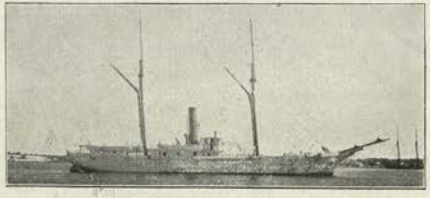
PAMLICO (1907). Steel, twin screw. 408 tons. Dimensions: 158×30×5 ft. 2—3 pdr. *Sig.*: GVHJ. *Headquarters*: Newbern, N.C.



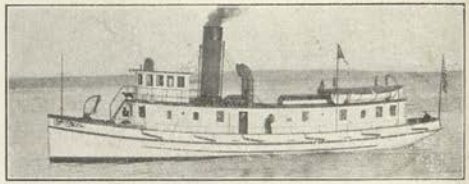
WINDOM (1896). Steel, twin screw. 528 tons. Dimensions: 170×27×9 ft. 4—3 pdr. *Sig.*: GVDT. *Headquarters*: Galveston, Tex.



WINONA (1890). Iron, twin screw. 340 tons. Dimensions: 148×26×6 ft. 1—3 pdr. S.A. *Sig.*: GVDP. *Headquarters*: Gulfport, Miss.

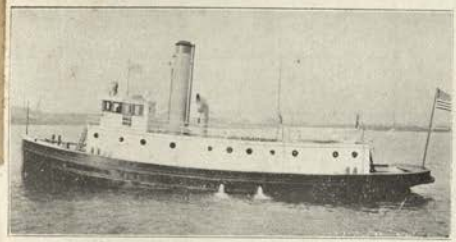


WOODBURY (1864). Wood, 1 screw. 500 tons. Dimensions: 146×28×11 feet. 1 gun. *Sig.*: GVBW. *Headquarters*: Eastport, Me.



ARCATA (1903). Wood, 1 screw. 130 tons. Dimensions: 85×17×10ft. *Sig.*: GVHC. *Headquarters*: Port Townsend, Wash.

CALUMET (1894). Iron, 1 screw. 169 tons. Dimensions: 94×20×8 feet. *Sig.*: GVDR. *Headquarters*: New York, N.Y.



DAVEY (1908). Steel, 1 screw. 153 tons. Dimensions: 92×19×10ft. *Sig.*: GVHM. *Headquarters*: New Orleans, La.

GOLDEN GATE (1896). Steel, 1 screw. 220 tons. Dimensions: 110×20×9 feet. *Sig.*: GVFH. *Headquarters*: San Francisco, Cal.

GUTHRIE (1895). Iron, 1 screw. 126 tons. Dimensions: 88×17×9ft. *Sig.*: GVBQ. *Headquarters*: Baltimore, Md

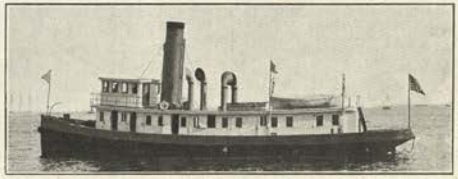
No photo available.

HARTLEY (1875). Wood, 1 screw. 48 tons. Dimensions: 64×11×6ft. *Sig.*: GVBT. *Headquarters*: San Francisco, Cal.

HUDSON (1893). Iron, 1 screw. 174 tons. Dimensions: 96×20×9ft. *Sig.*: GVDQ. *Headquarters*: New York, N.Y.

MACKINAC (1903). Steel, 1 screw. 220 tons. Dimensions: 110×20×10 feet. *Sig.*: GVHB. *Headquarters*: Sault Ste Marie, Mich.

MANHATTAN (1873). Iron, 1 screw. 174 tons. Dimensions: 102×20×8 feet. *Sig.*: GVCD. *Headquarters*: New York, N.Y.



WINNISIMMET (1903). Steel, 1 screw. 174 tons. Dimensions: 96×20×9 feet. *Sig.*: GVFW. *Headquarters*: Boston, Mass.

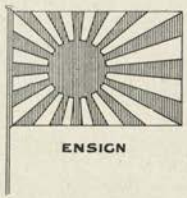
WISSAHICKON (1904). Steel, 1 screw. 174 tons. Dimensions: 96×20×8 feet. *Sig.*: GVHO. *Headquarters*: Philadelphia, Pa.

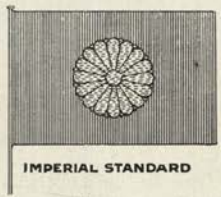
7 Launches.

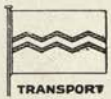
ALERT	(1907).	17 tons.	*Sig.*: GVFR.		*Station*:	Mobile, Ala.
GUIDE	(1907).	32 ,,	,,	—	,,	New York, N.Y.
PATROL	(1899).	15 ,,	,,	—	,,	Chicago, Ill.
PENROSE	(1883).	30 ,,	,,	GVDL.	,,	Pensacola, Fla.
SCOUT	(1896).	30 ,,	,,	GVFC.	,,	P. Townsend, Wash.
TYBEE	(1895).	40 ,,	,,	GVDW.	,,	Savannah, Ga.
VIGILANT	(1910).	12 ,,	,,	—	,,	Sault Ste Marié, Mich.

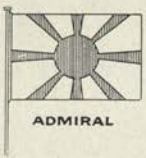
JAPANESE FLEET.

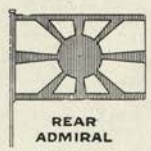
Officially revised, by order of the Minister of Marine.











YOKOSUKA

to	knots.
Hakodate	450
Hong Kong	1580
Honolulu	3400
Kobe	300
Kure	400
Manila	1720
Nagasaki	760
Ryojun (Port Arthur) ...	1350
Saigon	2400
Shanghai	1050

MAITSURU

to	knots.
Matsumai	440
Nagasaki	400
Ominato	465
Takeshiki	340
Vladivostock	620

NAGASAKI

to	knots.
Chemulpo	446
Foo-chau	650
Hong Kong	1067
Kelung (Formosa) ...	630
Kiao-chau	450
Kure	240
Kobe	340
Maidzuru	400
Manila	1300
Masampho	170
Matsumai	750
Pescadores	820
Ryojun (Port Arthur) ...	585
Takeshiki	120
Saigon	1990
Shanghai	330
Vladivostock	620
Wei-hai-wei	480

(RYOJUN) PORT ARTHUR

to	knots.
Hong Kong	1275
Kiao-chau	280
Nagasaki	585
Vladivostock	1170
Wei-hai-wei	100

TAKESHIKI

to	knots.
Kiao-chau	420
Maidzuru	340
Masampho	70
Matsumai	600
Nagasaki	120
Ryojun (Port Arthur) ...	500
Vladivostock	525
Wei-hai-wei	430

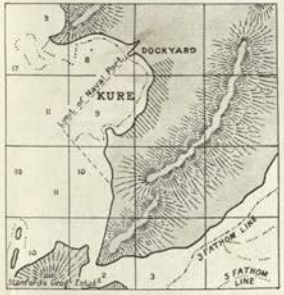
MATSUMAI

to	knots.
Maidzuru	440
Nagasaki	750
Ryojun (Port Arthur) ...	1150
Takeshiki	600
Vladivostock	380
Yokosuka	560
Nearest Russian coast (150 English miles N.E. by E. of Vladivostock)	250

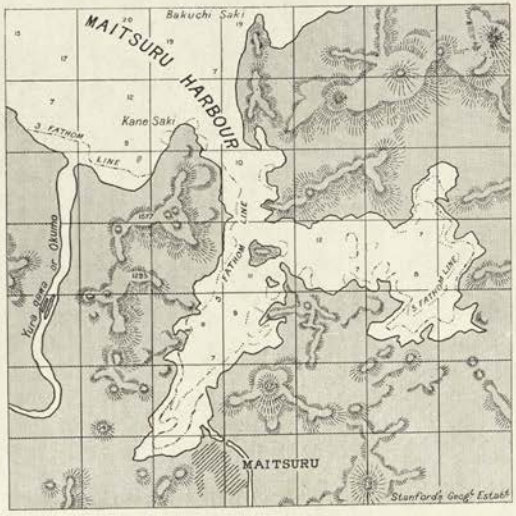
JAPANESE DOCKYARDS.

Divided into 2000 yard squares. Uniform scale. Soundings in fathoms. Heights in feet.

YOKOSUKA.



KURE.



MAIDZURU.

RYOJUN (PORT ARTHUR).

Imperial Dockyards. Principal Naval Harbours (*Ching-ju-fu*).

YOKOSUKA (in Sagami). One slip. No. 4, $538 \times 98\frac{1}{2} \times 32$, able to take any ship. Also one dock (No. 2) $447 \times 94\frac{1}{2} \times 29$ feet; two others: No. 1, $298 \times 82 \times 21$ feet; No. 3, $265 \times 45 \times 18$ feet. There are also two small docks at Tokio. At Yokohama there are now three docks: (*a*) $483\frac{1}{2} \times 93\frac{1}{4} \times 28$; (*b*) $351 \times 60 \times 26$. (*c*) $481 \times 67 \times 21\frac{1}{2}$ (completed 1910). At Uraga, also two docks: (*a*) $482 \times 60 \times 25\frac{1}{2}$; (*b*) $448 \times 53\frac{1}{2} \times 24$.
Admiralty Chart No. 997.

KURE (in Aki). One slip. Docks No. 1, $413 \times 58\frac{1}{2} \times 28$ feet; No. 2, $485\frac{1}{2} \times 81 \times 35\frac{1}{2}$ feet. Armour plate factory here.
Admiralty Chart No. 3469.

SASEBO (in Hizen). One slip. There are docks here: (1) $435 \times — \times —$; (2) $377 \times — \times —$; (3) $538 \times 93\frac{1}{2} \times 33$. There is also a floating dock for torpedo craft here. New dock: $777 \times 111 \times 38$ feet (1913).
Admiralty Chart No. 359.

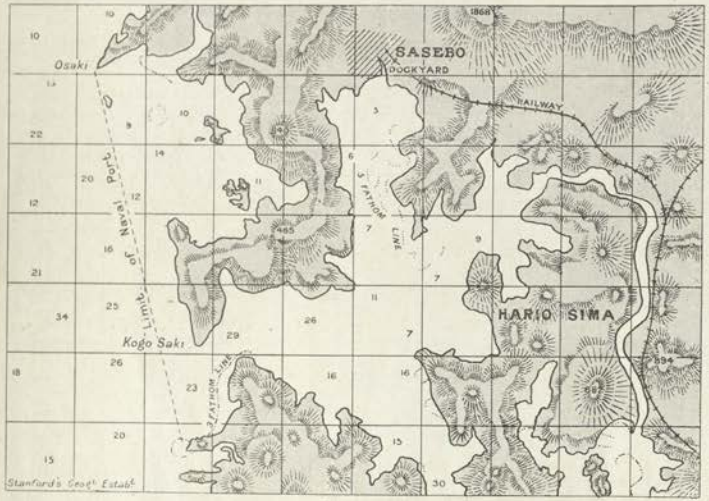
MAIDZURU (or MAIZURU) (in Tango). New dockyard.
Admiralty Chart No. 2174. One dock 450 feet long, one small for t.b. (completed 1908), a third dock 540 feet long completed 1913.

RYOJUN (PORT ARTHUR). One dry dock too narrow for battleships; two docks partly built.
Admiralty Chart No. 1236-1798.

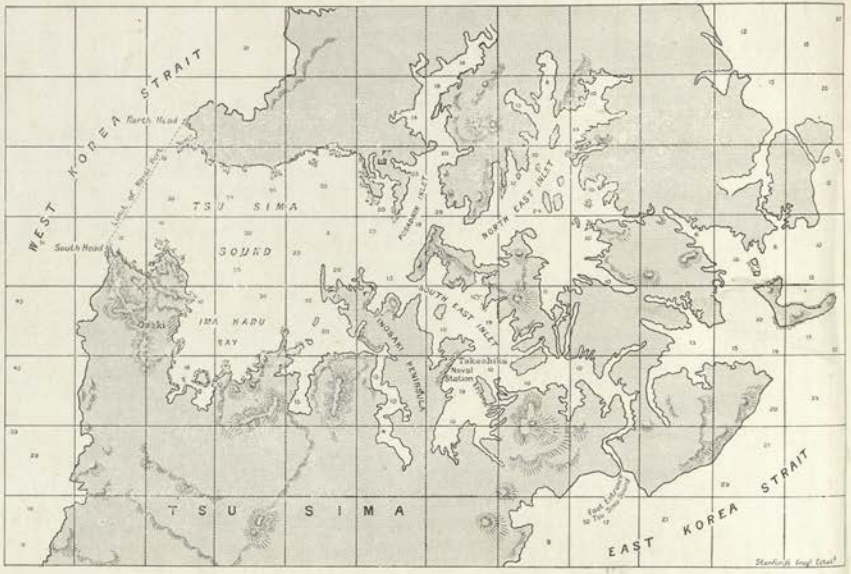
MASANPO.

JAPANESE DOCKYARDS.

Divided into 2000 yard squares. Uniform scale. Soundings in fathoms. Heights in feet.



SASEBO.



TAKESHIKI (in Tsushimi).

Lesser Naval Harbours (*Yoko*).

TAKESHIKI (Tsushima Island). Coaling station. Strongly fortified advance base. 280 foot pontoon for t.b.d's.
OMINATO. Torpedo base.
BAKO (Pescadores).

Mercantile Marine.

Total tonnage about 1,205,000. About 1800 steamers (including large liners), about 4000 sailing ships, and some 20,000 junks, &c., for coast trade.

Coinage.

1 Yen (100 sen) = 2s. 0½d. British, $0.50 U.S.A., *about*.

Principal Mercantile Ports.

Yokohama, Hakodate, Nagasaki, Moji, Kobé, Pairen (Dalny).

Private Docks.

At Nagasaki there are two docks (Mitsu Bishi Co.) one $714 \times 88\frac{1}{2} \times 34\frac{1}{2}$ feet, the other $510 \times 77 \times 27\frac{1}{2}$ feet. Also two smaller docks.

Hakodate. $480 \times 72 \times 30\frac{1}{2}$. Cannot take vessels drawing over $24\frac{1}{2}$ feet, as channel leading to dock is too shallow.

Kobé (Kawasaki Co.), $407 \times 64 \times 24$, and two big floating docks (Mitsu Bishi Co.)

Principal Naval Guns.

* = Q.F. with brass cartridge case.

Notation.	Calibre.	Length in calibres.	Model.	Weight of Gun.	Weight of A.P. shot.	Maximum Initial Velocity.	Maximum penetration firing A.P. capped at K.C.		Danger space against average ship, at			Service rate of Fire. Rounds per minute.
							5000 yards.	3000 yards.	10,000 yards.	5000 yards.	3000 yards.	
	inches.			tons.	lbs.	F. S.	inches.	inches.				
A^8	14	45	Y	82	1400	...	...	...	...	...	...	...
A^3	12·5	40	C	66	990	2306	12	15	...	...	...	0·2
A^5	12	45	('04)	58½	850	2800	16	20	185	500	780	...
A^3	12	40	E	49	850	2423	12	15½	120	450	720	1
A^3	10	45	E	32½	500	2710	10¼	13⅛	150	480	720	3
A^3	10	45	O	32	490	2500	9	12	130	450	700	...
B	9	35	O	19½	268	2400	5	7	...	...	...	...
A^*	8	45	O	15	188	2800	7	10	105	430	625	1
A	8	45	E	17	250	2740	7	10	110	425	600	1·2
B^*	8	40	E	15½	250	2580	5½	7½	100	400	580	1·2
C	6	45	('04)	8½	100	3000	4	6	75	250	475	...
C	6	50	V	8	100	3000	4	6	75	250	475	6
E^*	6	40	E	6½	100	2500	3	4	65	210	435	7
F^*	6	40	E	6	100	2220	2½	4	35	150	360	8
F^*	4·7	45		...	...	...	...	...	...	...	...	...
F^*	4·7	40	E	2	45	2150	...	2½	...	...	...	8
F^*	4·7	32	E	1⅔	36	1938	...	...	...	...	...	8-6
F^*	3	...		...	14	...	...	...	...	...	...	...
F^*	3	40		2	12	2200	...	...	...	...	...	...

In the Model column C = Schneider-Canet; E, Elswick; O, Obuchoff (Russian); V, Vickers.

Official Classification of Ships.

The official classification, instituted in 1912, is as follows:—

Battleships	Battle-Cruisers	1st class Coast Defence Ships	1st class Cruisers	2nd class Cruisers	2nd class Coast Defence Ships
Fu-so	*Kirishima*	Iwami	Nisshin	Hirato	Okinoshima
Settsu	*Haruna*	Fuji	Kasuga	Chikuma	Mishima
Kawachi	Hi-yei	Suwo	Aso	Yahagi	Chiyoda
Aki	Kongo	Sagami	Idzumo	Tone	Akitsushima
Satsuma	Kurama	Tango	Iwate	Otowa	Manchu
Kashima	Ibuki	Iki	Yakumo	Niitaka	Hashidate
Katori	Tsukuba		Azuma	Tsushima	Itsukushima
Mikasa	Ikoma		Asama	Soya	Takachiho
Asahi			Tokiwa	Tsugaru	
Shikishima				Kasagi	
Hizen				Chitose	
				Suma	
				Akashi	

Destroyers:—1st class, over 1000 tons; 2nd class, 1000-600 tons; 3rd class, under 600 tons.
Torpedo boats:—1st class, over 120 tons; 2nd class, under 120 tons.

Torpedo.

Whiteheads of the usual models. *Submerged tubes* are Elswick pattern.

Personnel: Active, *about* 48,000 all ranks. Also 15,000 Reserves.
Minister of Marine: Vice-Admiral Baron Saito. *Vice-Minister*: Rear-Admiral Takarabe.
Chief of Staff: Admiral Baron Goro Ijuin, K.C.B. *Assistant Chief of Staff*: Vice-Ad. Fujii.
Chief Constructor:

Cap.

The cap is the same as the British (but without gold embroidery in the senior ranks).

Cap Badge.

Small anchor, surrounded by cherry leaves.

INSIGNIA OF RANK—EXECUTIVE OFFICERS—SLEEVES. (Changed to this; 1908).

Sho-i Ko-hoshei., *Midshipman.*

	Tai-sho.	Chu-sho.	Sho-sho.	Tai-sa.	Chu-sa	Sho-sa.	Tai-i.	Chu-i.	Sho-i	Has a stripe half the width of a Sho-i.
Executive Branch:										
Corresponding British or U.S.:	*Admiral*	*Vice-Ad.*	*Rear-Ad.*	*Captain.*	*Commander.*	2½ *Lieut. Lieut. Com.*	*Lieutenant.*	*Sub-Lieut.*	*Acting Sub-Lieut.*	

Band between stripes. (Branches, with but after Executive).

Violet	Kikwan (*Engineer*) (with executive rank and curl. Titles as above with the prefix Kikan).	
Red	Gun-i (*Doctor*).	
White	Shukei (*Paymaster*).	without curl.
Brown	Zosen (*Constructor*).	
Purple	Zohei (*Gun Constructor*).	
Blue	Suiro (*Hydrographer*).	

The senior officer of any branch on board the ship always carries the affix "*cho.*" Thus: Ho-jitsu-cho (*Gunnery*), Sui-rai-cho (*Torpedo*), Ko-kai-cho (*Navigator*), Guin-i-cho (*Senior Doctor*), Shukei-cho (*Senior Paymaster*).

Undress is a military tunic (dark blue) with the sleeve insignia of rank in black braid only, with curl for executives and engineers. Other branches cannot be distinguished from each other in this tunic.

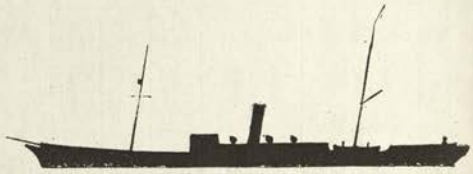
JAPANESE WARSHIPS (ONE FUNNEL) IDENTIFICATION AND SIGNAL SILHOUETTES. *(Copyright).*

ONE FUNNEL.

AB Sumida *(river gunboat).*

AC Itsukushima *class* (2 ships).

AG Takachiho.



AH Karasaki (t.b. depôt).

AN Toyohashi (t.b. depôt).

AO Chiyoda *(page 234).*

TWO FUNNELS.

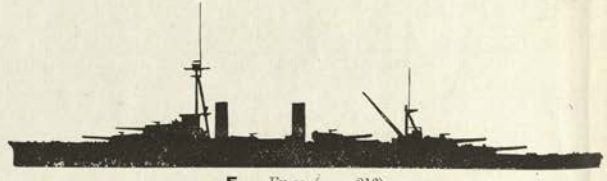
GA Fushimi *(river gunboat).*

GB Yodo *(page 240).*

GC Akashi *(page 237).*

GD Suma *(page 239).*

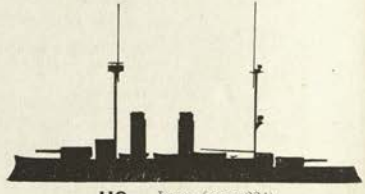
HA Kasuga *class (page 231)* (2 ships).



F Fu-so *(page 216).*

G Satsuma *(page 221).*

H Tsukuba *class* (2 ships) *(page 222).*



HG Iwami *(page 224).*

[Continued next page.

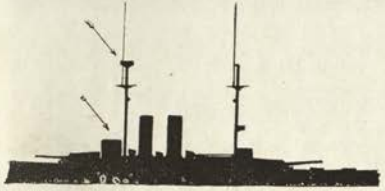
TWO FUNNELS—*(Continued)*.

HI Tango (*page* 230).

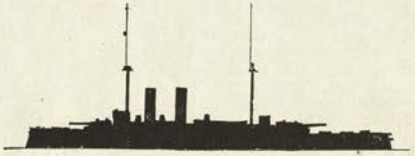
HK Iki (*page* 230).

IH Katori (*page* 223).

IH Kashima (*page* 223).

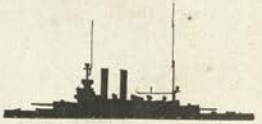


IK Mikasa (*page* 225).



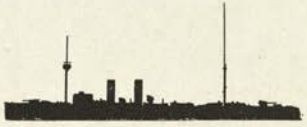
IL Asahi (*page* 227).

KG Fuji (*page* 229).



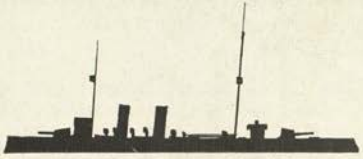
KH Okinoshima *class* (*page* 230) (2 ships).

KI Asama *class* (*page* 234) (2 ships).



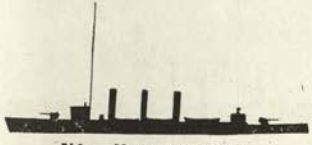
KL Akitsushima (*page* 239).

LG Chihaya (*page* 240).

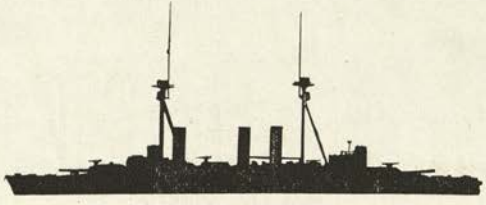


LH Kasagi *class* (*page* 237) (2 ships).

THREE FUNNELS.



NA Mogami (*page* 240).



N Kawachi (*page* 218).

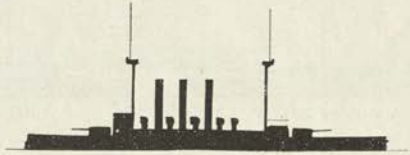
O Aki (*page* 219).

OG Suwo (*page 228*).

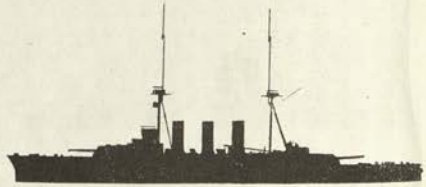
OH Sagami (*page 228*).

P Kongo (*page 217*).

PG Shikishima (*page 227*).

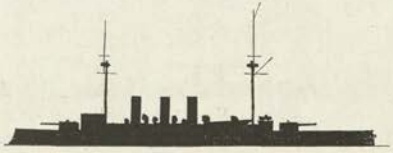


PH Idzumo *class* (*page 232*).

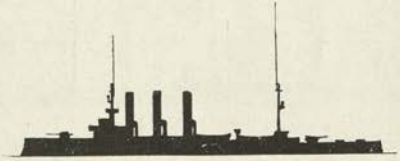


Q Kurama (*page 221*). (Ibuki same without tripods).

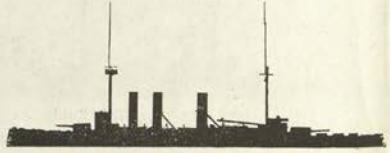
QG Hizen (*page 226*).



QH Yakumo (*page 233*).

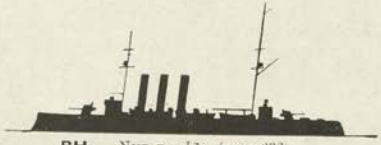


QI Tsugaru (*page 238*).

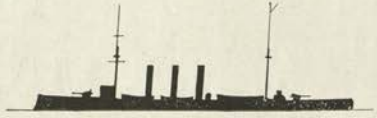


QK Azuma (*page 233*).

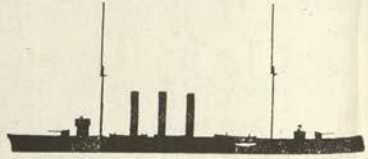
RG Tatsuta (*page 240*).



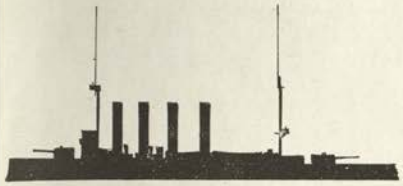
RH Niitaka *class* (*page 236*).



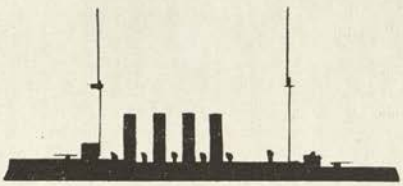
RI Otowa (*page 236*).



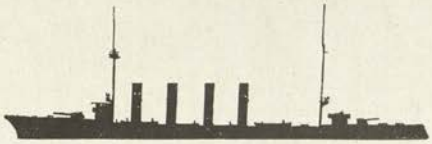
RK Tone (*page 235*).



YG Aso (*page* 232).



YH Soya (*page* 238).



YI Chikuma *class* (*page* 235).

TORPEDO CRAFT (*page* 213 *et seq.*)

JT cone.

B Old t. b.

TWO FUNNELLED TORPEDO CRAFT.

G Two Funnel Destroyers.

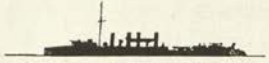
H Schichau t.b.

I Yarrow t.b.

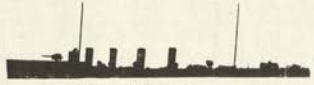
K Aotaka *class* t.b.

L Hayabusa *class* t.b.

N Sakura.



V Older Four Funnel Destroyers.



X Yamikaje.

JAPANESE FAST MERCHANT LINERS. **JM** cone.

G Tenyo Maru *class* (3), 21 kts. (*Toyo Kisen Kaisha*).

Tenyo Maru, Chiyo Maru, Genyo Maru.

13,450 tons gross. Displacement 21,000 tons. War Armament: 2—6 in., 6—12 pdr.

Schooner bow.

H 2 new ships (*T.K.K.*)

War Armament: 6—6 in., 10—12 pdr.

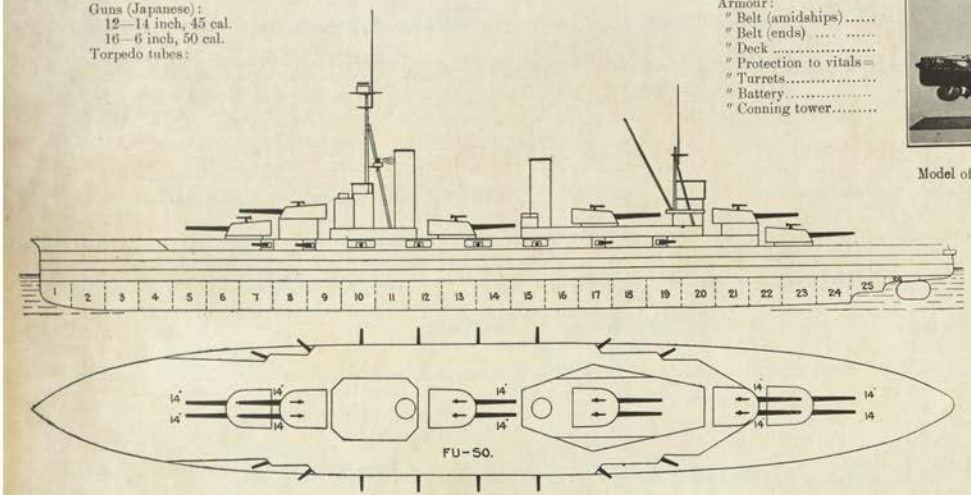
そさふ *FU-SO* (Feb., 1914), "*B*" (*building*), "*C*" (*building*), "*D*" (*building*).

Displacement, 30,600 tons. Complement,

Length, 673 feet. Beam, feet. *Maximum* draught, feet. Length *over all*, feet.

Guns (Japanese):
12—14 inch, 45 cal.
16—6 inch, 50 cal.
Torpedo tubes:

Armour:
" Belt (amidships).....
" Belt (ends) ....
" Deck .....
" Protection to vitals=
" Turrets.....
" Battery.....
" Conning tower.....



Model of the Fu-So. *Official photo*

Machinery:
Coal: *normal*, tons; *maximum*, tons.
Screws. Boilers: Miyabara. Designed H.P. 40,000= kts.

Name.	*Builder.*	*Machinery.*	*Laid down*	*Completed.*	*Trials.*	*Turbine*	*Boilers*	*Best recent speed*
Fu-So.	Kure	Vickers	Mar.'12	'15		Parsons	Miyabara	
"*B*"	Yokosaka		Nov.'13	'16				
"*C*"	Kawasaki	Kawasaki	'14	'17				
"*D*"	Mitsubishi	Mitsubishi	'14	'17				

1911 JAPANESE BATTLE-CRUISERS. (Dreadnoughts.) Nos. 3, 4, 5, 6

じんこ **KONGO** (1912), えひ **HI-YEI** (Nov., 1912), なろは *HARUNA* (Dec., 1913),
ましりき *KIRISHIMA* (Dec., 1913).

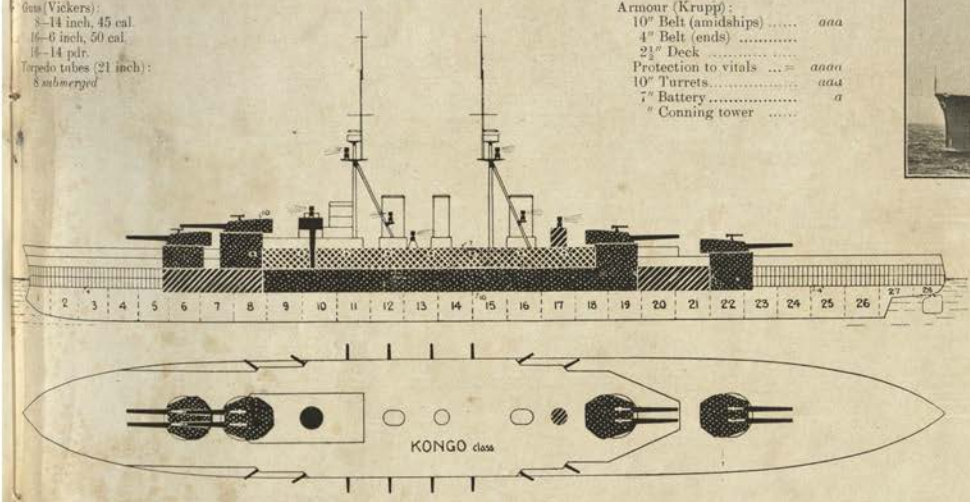
Displacement, 27,500 tons. Complement, 1100.

Length, 704 feet. Beam, 92 feet. *Maximum* draught, 29½ feet. Length *over all*, feet.

Guns (Vickers):
8–14 inch, 45 cal.
16–6 inch, 50 cal.
16–14 pdr.
Torpedo tubes (21 inch):
8 *submerged*

Armour (Krupp):

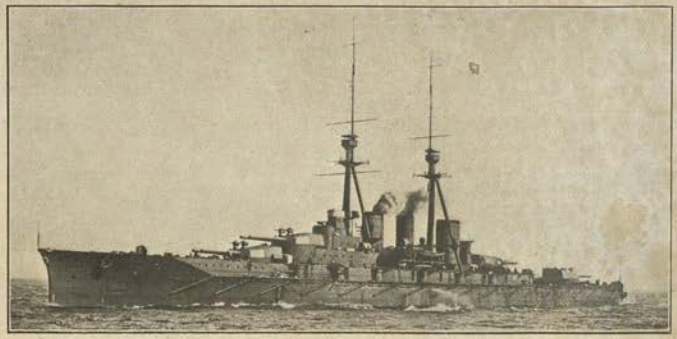
10″ Belt (amidships)	*aaa*
4″ Belt (ends)	
2½″ Deck	
Protection to vitals =	*aaaa*
10″ Turrets	*aaa*
7″ Battery	*a*
″ Conning tower	



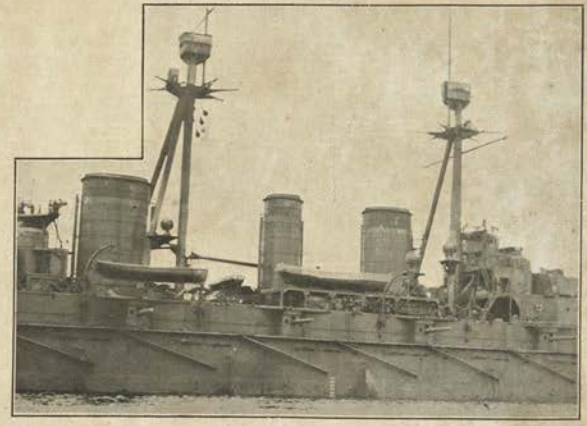
Broadside: 8—14 in.

Machinery: Parsons 4-shaft or Curtis 3-shaft turbine. Designed H.P. 68,000 = 27 kts. Boilers: See *Notes*. Coal: *normal*, 1,000 tons; *maximum*, 4,000 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbine*	*Boilers*	*Best recent speed*
Kongo	Vickers	Vickers	Jan. '11	July '13		Parsons	Yarrow	
Hi-yei	Yokosuka	Kawasaki	Nov. '11	1914		Parsons	Miyabara	
Haruna	Kawasaki	Kawasaki	Mar. '12	1915		Curtis	Miyabara	
Kirishima	Mitsubishi	Mitsubishi	Mar. '12	1915		Parsons	Miyabara	



Photo, Sankey, Barrow.



Photo, E. M. Larken, Esq.

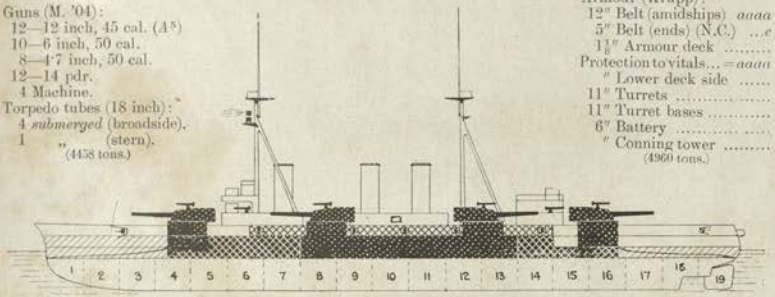
ちはか **KAWACHI** (Nov., 1910) & つくも **SETTSU** (April, 1911).

Displacement, 21,420 tons. Complement, 960.

Length (*p.p.*), 500 feet. Beam, 84 feet. *Maximum* draught, 28¼ feet. Length *over all*, *K.* 526 ft., *S.* 533 ft.

Guns (M. '04):
12—12 inch, 45 cal. (*A*[s])
10—6 inch, 50 cal.
8—4·7 inch, 50 cal.
12—14 pdr.
4 Machine.
Torpedo tubes (18 inch):
4 *submerged* (broadside).
1 „ (stern).
(4458 tons.)

Armour (Krupp):
12″ Belt (amidships) *aaaa*
5″ Belt (ends) (N.C.) ...*e*
1½″ Armour deck .....
Protection to vitals... =*aaaa*
″ Lower deck side .....
11″ Turrets .....
11″ Turret bases .....
6″ Battery .....
″ Conning tower .....
(4960 tons.)



Ahead: 6—12 in.

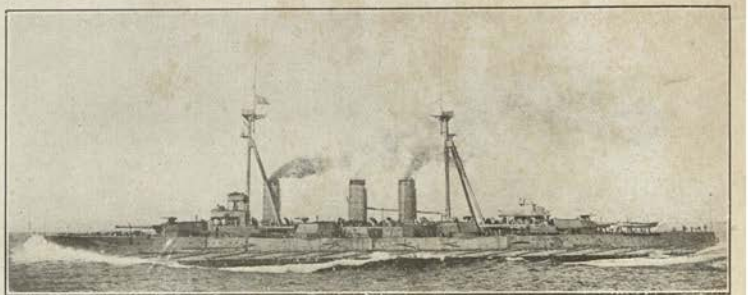
Astern: 6—12 in.

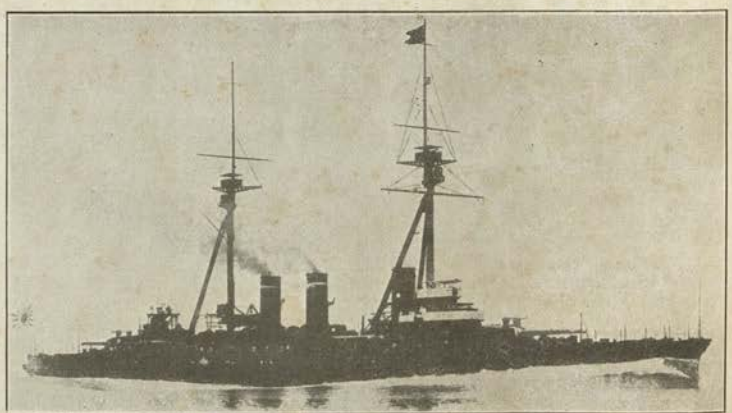
Broadside: 8—12 in.

Machinery: *Kawachi*, Curtis turbine; 3 screws. *Settsu*, Parsons turbine; 4 screws. Boilers: Miyabara. Designed H.P. 25,000=20 kts. Coal: *normal*, 11,000 tons; *maximum* 2500 tons.

Engineering Notes.—Weight of machinery, 2146 tons.

Name.	*Built at*	*Laid down.*	*Completed.*	*Trials.*		*Turbines*	*Boilers.*	*Best recent speed.*
Kawachi	Kure	Jan., '09	1912	=	=	Curtis	Miyabara	
Settsu	Yokosuka	April,'09	1913	=	=	Parsons	Miyabara	





1905 JAPANESE SEMI-DREADNOUGHT. (First-class Battleship.) (20·5 knot.)

AKI あき (April, 1907).

Displacement, 19,800 tons. Complement, ——.

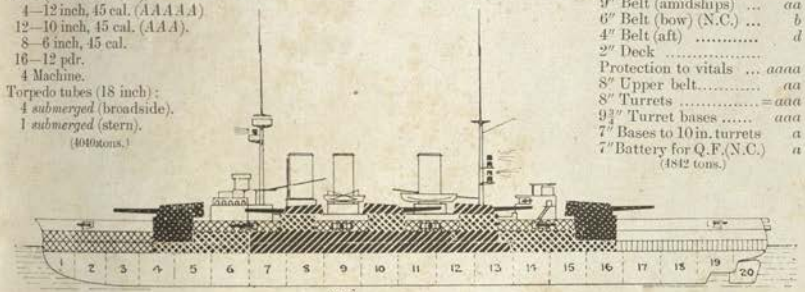
Length (*o.a.*), 492 feet; *p.p.*, 460 feet. Beam, 83¾ feet. *Maximum* draught, 28¾ feet.

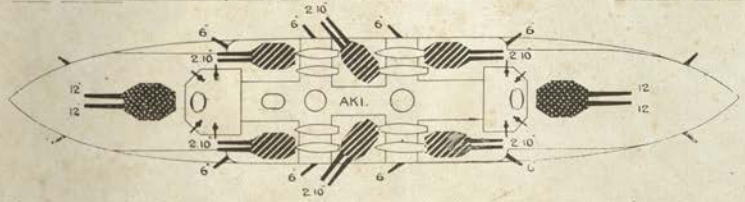
Guns (Elswick M. '04):
4—12 inch, 45 cal. (*AAAAA*)
12—10 inch, 45 cal. (*AAA*).
8—6 inch, 45 cal.
16—12 pdr.
4 Machine.
Torpedo tubes (18 inch):
4 *submerged* (broadside).
1 *submerged* (stern).
(4040tons.)

Armour (Krupp):

9″ Belt (amidships) ...	*aa*
6″ Belt (bow) (N.C.) ...	*b*
4″ Belt (aft)	*d*
2″ Deck	
Protection to vitals ...	*aaaa*
8″ Upper belt.....	*aa*
8″ Turrets .....=	*aaa*
9¾″ Turret bases	*aaa*
7″ Bases to 10 in. turrets	*a*
7″ Battery for Q.F.(N.C.)	*a*

(4842 tons.)





Ahead:
2—12 in.
4—10 in.
2—6 in.

Astern:
2—12 in.
4—10 in.
2—6 in.

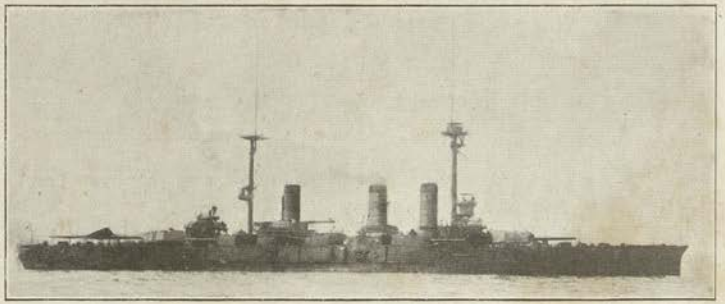
Broadside: 4—12 in., 6—10 in., 4—6 in.

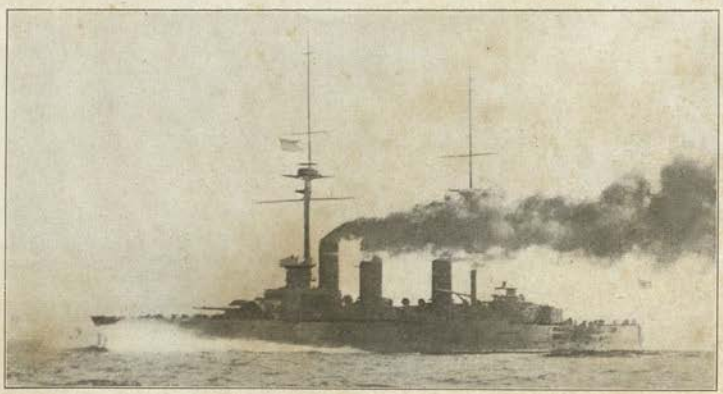
Machinery: Curtis turbine. screws. Boilers: Miyabara. Designed H.P. 25,000=20 kts. Coal: *normal*, 900 tons; *max.*, 2500 tons.

Gunnery Notes.—Turrets worked both electrically and hydraulically.
Torpedo Notes.—Bullivant net defence; main deck shelf.
Engineering Notes.—Weight of machinery, 2146 tons.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Trials.*	*Turbines.*	*Boilers.*	*Best recent speed.*
Aki	Kure	Fore River Co. U.S.A.	Mar. '05	1911	=20·7	Curtis	Miyabara	

General Notes.—Hull and fittings, 6764 tons. Equipment 754 tons.





1905 JAPANESE SEMI-DREADNOUGHT. (First-class Battleship.) (20 knot.)

SATSUMA まつしま (15th November, 1906).

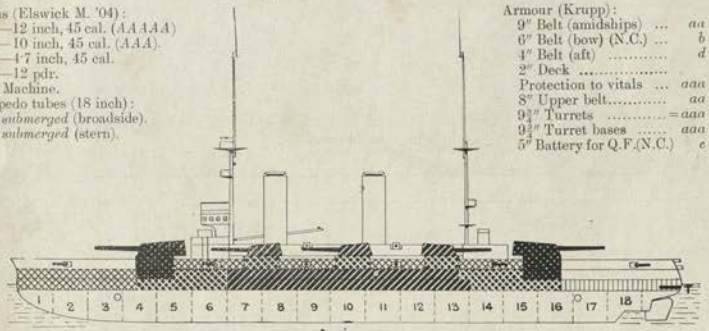
Normal displacement, 19,370 tons. Complement, .

Length (*waterline*), 479 ft. Beam, 83½ ft. *Maximum* draught, 28¾ ft. Length *over all*, 482 ft.; *p.p.*, 450 ft.

Guns (Elswick M. '04):
4—12 inch, 45 cal. (*AAAAA*)
12—10 inch, 45 cal. (*AAA*).
12—4·7 inch, 45 cal.
4—12 pdr.
4 Machine.
Torpedo tubes (18 inch):
4 *submerged* (broadside).
1 *submerged* (stern).

Armour (Krupp):

9″ Belt (amidships) ...	*aa*
6″ Belt (bow) (N.C.) ...	*b*
4″ Belt (aft)	*d*
2″ Deck	
Protection to vitals ...	*aaa*
8″ Upper belt.....	*aa*
9¾″ Turrets .....=	*aaa*
9¾″ Turret bases	*aaa*
5″ Battery for Q.F.(N.C.)	*c*



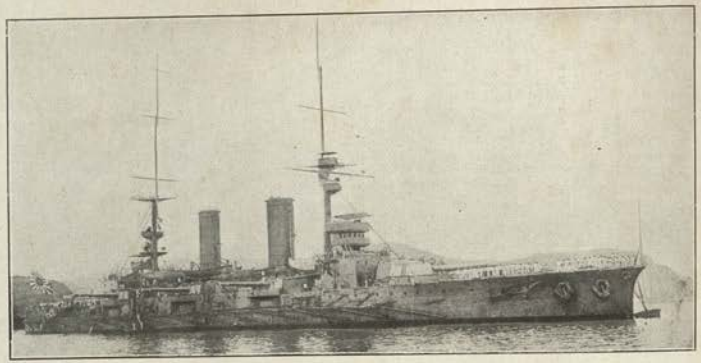
Ahead:
2—12in.
4—10in.

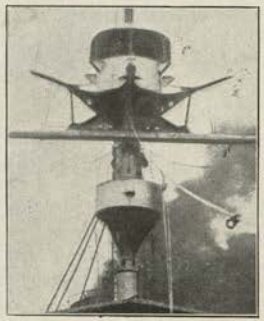
Broadside: 4—12 in., 6—10 in., 6—6 in.

Astern:
2—12 in.
4—10 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: Miyabara. Designed H.P. 17,300 = 18·25 kts.
Coal: *normal* 1000 tons; *maximum* 2500 tons.
Gunnery Notes—Turrets worked both electrically and hydraulically.
Torpedo Notes.—¾ net defence; main deck shelf.
Engineering Notes.—

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Refit.*	*Machinery*	*Boilers.*	*Best recent speed.*
Satsuma	Yokosuka		May, '05	1910			Miyabara	





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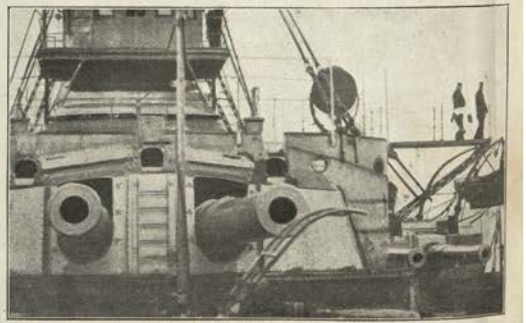


FORE TURRET

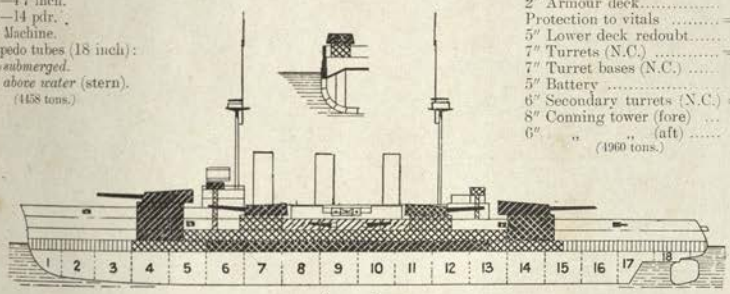
まらく **KURAMA** (Oct., 1907), & **IBUKI** (Nov., 1907). きぶき

Normal displacement, 14,600 tons. Complement, 817.

Length (*p.p.*), 450 feet. Beam, 75½ feet. *Mean* draught, 26 feet. Length *over all*, 485 feet.

Guns:
4—12 inch, 45 cal. (*AAAAA*).
8—8 inch, 45 cal. (*A*).
14—4·7 inch.
4—14 pdr.
4 Machine.
Torpedo tubes (18 inch):
2 *submerged*.
1 *above water* (stern).
(1458 tons.)

Armour (Krupp):
7″ Belt (amidships) ..... *a*
4″ Belt (ends) (N.C.) ..... *d*
2″ Armour deck.....
Protection to vitals .....=*aa*
5″ Lower deck redoubt..... *b*
7″ Turrets (N.C.) .....=*aa*
7″ Turret bases (N.C.) ..... *a*
5″ Battery .....
6″ Secondary turrets (N.C.) = *a*
8″ Conning tower (fore) ... *a*
6″ „ „ (aft) ..... *b*
(1960 tons.)



Ahead:
2—12
4—8
4—6

Astern:
2—12
4—8
4—6

Broadside: 4—12 in., 4—8 in., 6—6 in.

Machinery: *Kurama*, 2 sets reciprocating. 2 screws. *Ibuki*, Curtis turbine. Boilers: Miyabara. Designed H.P., *Kurama*, 22,500=21·25 kts.; *Ibuki*, 24,000=22 kts. Coal: *normal*, 600 tons; *maximum*, 2000 tons.

Armour Notes—Main belt is 7½ feet wide, thinning at ends.

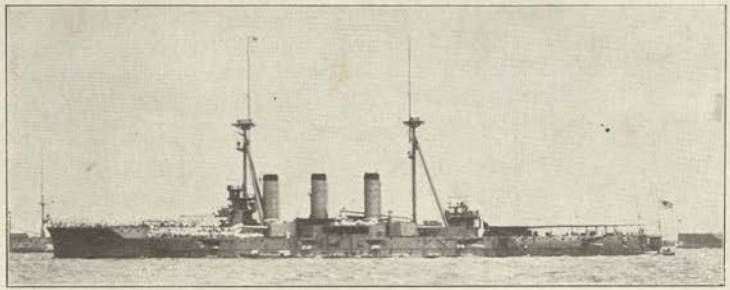
Gunnery Notes—Loading positions, big guns: all round. Hoists: electric. Big guns: hydraulic and electric gears; secondary turrets, electric gear. Arcs of fire: 12 inch, 270°; secondary turrets, about 130°.

Torpedo Notes.—Bullivant net defence to both ships.

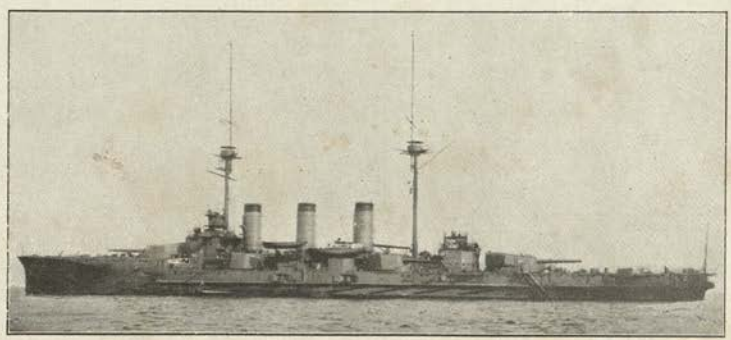
Engineering Notes.—Weight of machinery, 2078 tons.

Name.	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials.*		*Boilers.*	*Best recent speed*
					at 4/5.	*6 hrs. f.p.*		
Kurama	Yokosuka		Aug.,'05	1910	20,978=21	27,142=22·17	Miyabara in both.	
Ibuki	Kure		May,'06	Sept.'09				

General Notes.—Weights: hull and fittings, 6105 tons; equipment, 731 tons.



KURAMA. *Photo, Symonds.*



IBUKI.

Note difference.—*Kurama* has tripod masts.

1905 JAPANESE ARMOURED SHIPS (20½ knot).

(Tsukuba Class.—2 Ships.)

ほくつ **TSUKUBA** (December, 1905), & **IKOMA** (April, 1906). まこま

Displacement, *normal* 13750 tons; *full load* 15,150 tons. Complement, 817.

Length (*p.p.*), 440 feet; *o.a.*, 475 feet. Beam, 75 feet. *Mean* draught, 26 feet.

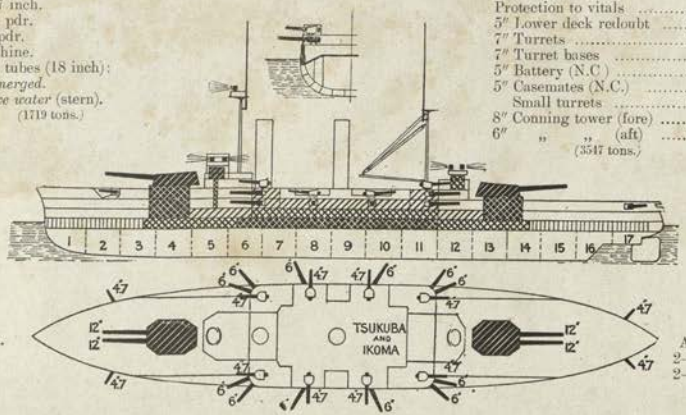
Guns:
4—12 inch, 45 cal. (*AAAAA*)
12—6 inch, 45 cal.
12—4·7 inch.
2—14 pdr.
3—3 pdr.
6 Machine.

Torpedo tubes (18 inch):
2 *submerged*.
1 *above water* (stern).
(1719 tons.)

Armour (Krupp C. & N.C.):

7″ Belt (amidships)	*a*
4″ Belt (ends)	*d*
2″ Armour deck	
Protection to vitals	= *aa*
5″ Lower deck redoubt	*b*
7″ Turrets	= *aa*
7″ Turret bases	*a*
5″ Battery (N.C.)	*c*
5″ Casemates (N.C.)	*c*
Small turrets	
8″ Conning tower (fore)	*a*
6″ „ „ (aft)	*b*

(3547 tons.)



Ahead:
2—12 in.
2—6 in.

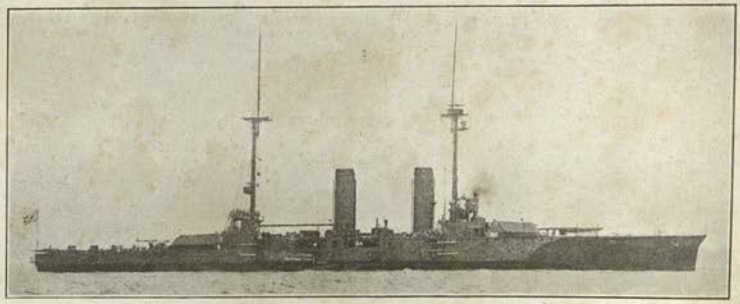
Astern:
2—12 in.
2—6 in.

Broadside: 4—12 in., 6—6 in.

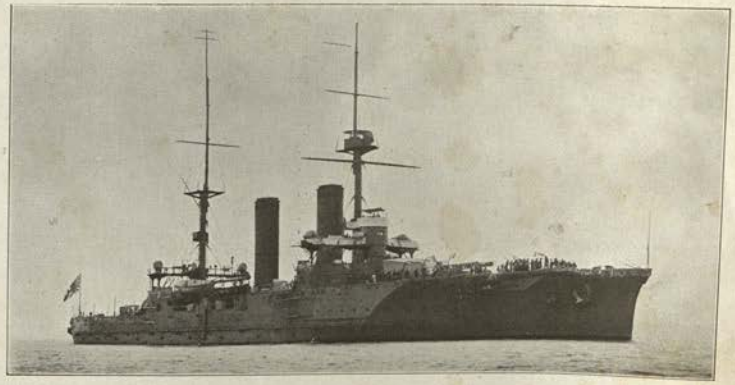
Machinery: 2 sets reciprocating. 2 screws. Boilers: Miyabara. Designed H.P. 20,500 = 20·5 kts.
Coal: *normal*, 600 tons; *maximum*, 2000 tons. Weight of machinery, 2132 tons.
Torpedo Notes.—Bullivant net defence to both.

Name.	*Builder*	*Machinery.*	*Laid down.*	*Completed.*	*Trials.*	*Boilers.*	*Last recorded best speed.*
Tsukuba	Kure		Jan.'05	1907	20,736 = 20·5	Miyabara in both.	21
Ikoma	Kure		Mar.'05	1907	=		...

General Notes.—Weights: hull 5031 tons equipment, 663 tons.



Tsukuba.



Ikoma. *Photo, Symonds*

(KASHIMA CLASS.—2 SHIPS).

まいか KASHIMA (March, 1905) & りとか KATORI (July, 1905).

Displacement, *Kashima*, 16,400 tons; *Katori*, 15,950 tons. Complement, 864.

Kashima—Length, (*o.a.*), 470 feet; *p.p.*, 425 feet. Beam, 78 ft. 1¼ in. *Mean* draught, 26 ft. 7½ in.

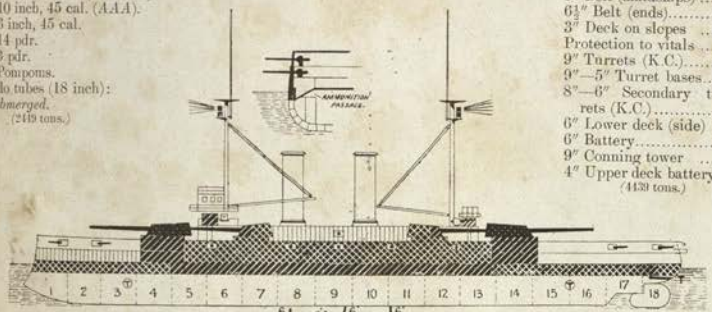
Katori— „ „ 456¼ feet; „ 420 feet. „ 78 ft. 0¾ in. „ 27 ft.

Guns (Elswick M. '04.):
4—12 inch, 45 cal. (*AAAAA*).
4—10 inch, 45 cal. (*AAA*).
12—6 inch, 45 cal.
12—14 pdr.
6—3 pdr.
6—Pompoms.
Torpedo tubes (18 inch):
5 *submerged*.
(2419 tons.)

Armour (Krupp):

9″ Belt (amidships)	*aa*
6½″ Belt (ends)	*a*
3″ Deck on slopes	
Protection to vitals	= *aaa*
9″ Turrets (K.C.)	*aaa*
9″—5″ Turret bases	*aa-b*
8″—6″ Secondary turrets (K.C.)	*aa-a*
6″ Lower deck (side)	*a*
6″ Battery	*a*
9″ Conning tower	*aa*
4″ Upper deck battery	*d*

(4439 tons.)



Ahead
2—12
2—10
2—6

Astern
2—12
2—10
2—6

Broadside: 4—12 in., 2—10 in., 6—6 in.

Machinery: 2 sets 4 cylinder vertical quadruple expansion. 2 screws. Boilers: Niclausse. Designed H.P. 17,000 = 18·5 kts. Coal: *normal*, 750 tons; *maximum*, 2,000 tons.

Armour Notes.—Belt is 7½ feet wide, 5 feet of it below waterline. Deck at ends is 2½″ all over. Screens between 6″ guns in battery. Special protection to magazines.

Gunnery Notes.—Loading positions all round. Hoists: electric, semi-automatic. Big guns manœuvred by electric, hydraulic and hand gear. 15 H.P. motors for big guns.

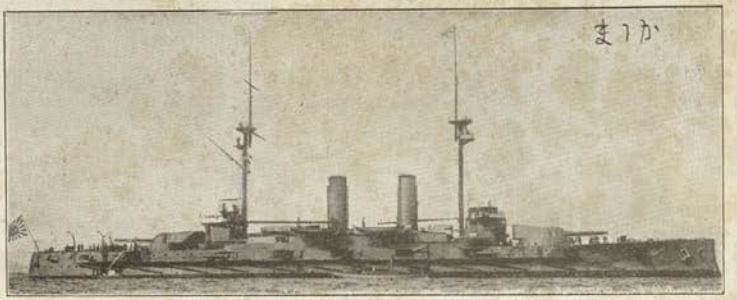
Arcs of fire: 12 in., 270° (train round in 60 seconds); 10 in., 120° from axial line; battery, 120°.

Height of guns above water: 12 in., 26 feet; 10 in., 22 feet; main deck guns, 14½ feet.

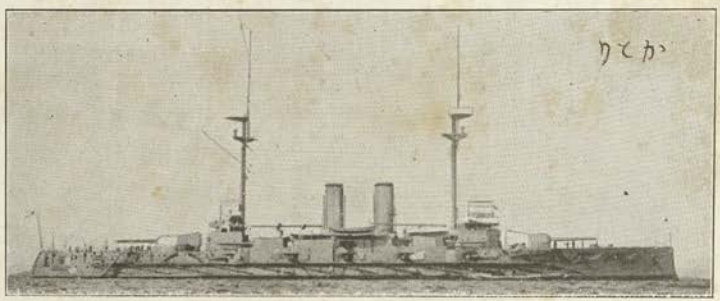
Torpedo Notes.—Bullivant net defence. 2 fast 56 feet torpedo launches carried. Stern *submerged tube*. 6 searchlights (automatic).

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Trials:—* *24 hours at 4/5.*	*8 hours Full power.*	*Boilers.*	*Best recent speed.*
Kashima	Elswick	Humphrys	Feb. '04	1906	13,000 = 18 kts.	17,280 = 19·24	Niclausse	
Katori	Vickers	Vickers	Feb. '04	1906	= 17·8 kts. (at ¾ths.)	18,500 = 20·22	Niclausse	

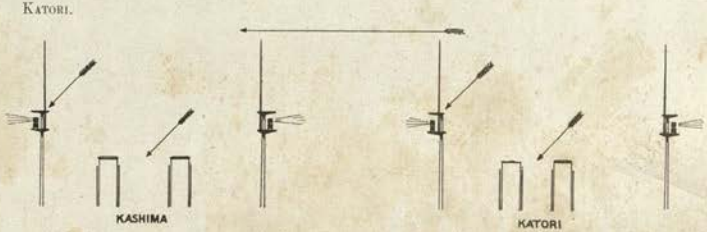
General Notes.—2 electric derricks. Steam boat hoists and after capstan. 10 boats carried. Machinery weight, 1606 tons. Equipment, 702 tons; hull, 5920 tons.



KASHIMA. Small fire controls now fitted to the tops of both these, and all other modern ships. *Kashima* has 2 port anchors and 1 starboard. *Katori* has 1 port and 2 starboard.



KATORI.



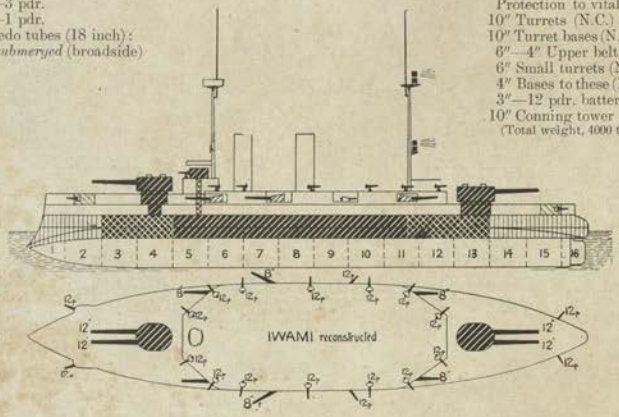
IWAMI みはい (July, 1902). (Reconstructed after battle, 1907).

Normal displacement, 13,566 tons. Complement, 750.

Length (*p.p.*), 376½ feet. Beam, 76 feet. *Mean* draught, 26 feet. Length *over all*, 397 feet.

Guns (Japanese & Obucholf):
4—12 inch, 45 cal. (*AAAA*) (Obucholf).
6—8 inch, 45 cal.
20—12 pdr.
20—3 pdr.
8—1 pdr.
Torpedo tubes (18 inch):
2 *submerged* (broadside)

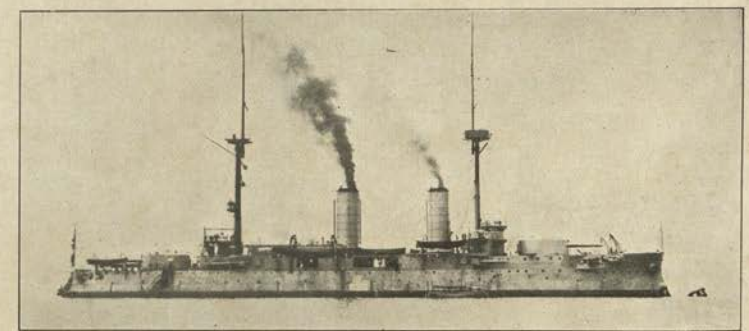
Armour (Krupp):
7½″ Belt (amidships)... *aa*
4″ Belt (ends) ..... *d*
3″ Armour deck (slopes)
Protection to vitals = *aaa*
10″ Turrets (N.C.) ..... *aa*
10″ Turret bases (N.C.) *aa*
6″—4″ Upper belt .....*a-d*
6″ Small turrets (N.C.) *b*
4″ Bases to these (N.C.) *d*
3″—12 pdr. battery ... *e*
10″ Conning tower ..... *aa*
(Total weight, 4000 tons).



Ahead:
2—12 in.
2—8 in.

Astern:
2—12 in.
2—8 in.

Broadside: 4—12 in., 3—8 in.



Present rig.

Machinery. 2 sets vertical 4 cylinder triple expansion. 2 screws. Boilers: 20 Belleville. Designed H.P. 16500 = 18 kts. Coal: *normal* 750 tons; *maximum* 1250 tons.

Armour Notes.—Belt is 6¾ feet wide, 5 feet of it below waterline; lower edge is 7″ thick amidships; upper belt 5¼ feet wide.

Gunnery Notes.—Loading positions big guns: all round. Hoists, electric and hand.
Big guns manœuvred electrically; secondary hand or electrically. Arcs of fire: Big guns 240° (nominal only); 8 in., 150°.

Torpedo Notes.—18 torpedoes carried. 6 searchlights (automatically controlled).

Engineering Notes.—Boilers placed fore and aft. Steamed 18 kts. on trial, 1907.

General Notes.—Laid down at Galernii Island, June, 1900. Completed for sea, September, 1904. Reconstructed 1906-07.

1899 JAPANESE BATTLESHIP (18 knot).

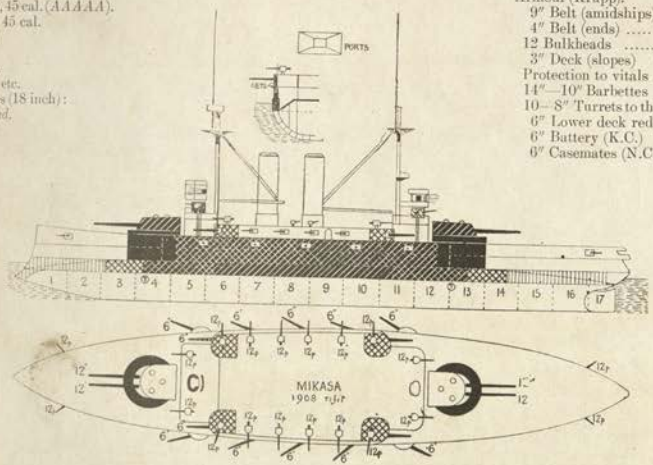
MIKASA さかみ (November, 1900). (Reconstructed 1907-08).

Displacement, 15,200 tons. Complement, 756. (Flagship 770.)

Length (*waterline*), 415 feet. Beam, 75½ feet. *Maximum* draught, 27½ feet. Length *over all*, 432 feet.

Guns (*See Note*):
4—12 inch, 45 cal. (*AAAAA*).
14—6 inch, 45 cal.
20—12 pdr.
8—3 pdr.
4—2½ pdr.
8 Maxims, etc.
Torpedo tubes (18 inch):
4 submerged.

Armour (Krupp).
9″ Belt (amidships) ..... *aa*
4″ Belt (ends) ..... *d*
12 Bulkheads ..... *aaa*
3″ Deck (slopes) .....
Protection to vitals ..... *aaa*
14″—10″ Barbettes .....*aaaa-aa*
10—8″ Turrets to these = *aaa-aa*
6″ Lower deck redoubt ..... *a*
6″ Battery (K.C.) ..... *a*
6″ Casemates (N.C.) ..... *b*



Ahead:
2—12 in.
4—6 in.

Astern:
2—12 in.
4—6 in.

Broadside: 4—12 in., 7—6 in.

Machinery: 2 sets 3 cylinder vertical triple expansion. 2 screws. Boilers: 25 Belleville. Designed H.P. 15,000 = 18 kts. Coal: *normal* 700 tons; *maximum* 1690 tons.

Armour Notes.—Thickest part of belt is 7½ feet wide by 156½ feet long; 5½ feet of it below waterline. Lower deck redoubt is 156 feet long. Battery has 2″ screens enclosing each gun and forming casemates. Deck: 3″ amidships; 4″ at barbettes; 2½″ at ends. Main deck, 1″.

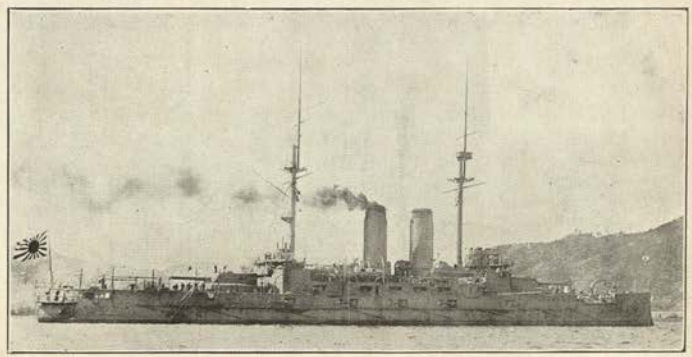
Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric, steam and hand. Big guns manœuvred hydraulic, steam and hand gear.
Arcs of fire: Big guns, 240°; secondary guns, about 120°.
Ammunition carried: Big guns, 60 rounds per gun; 6 inch, 200 per gun.
Height of guns above water: Big guns, 25 feet.

Torpedo Notes.—Nets (Bullivant) carried at main deck level. 6 searchlights (automatic).

Engineering Notes.—Machinery, 1355 tons. Grate area, 1276 feet. Heating surface, 37,452 feet.

Trials.—6 hours, 12,236 = 17·3 kts. (Consumption, 1·53 lbs). *Full power*, 16,400 = 18·6 kts. Can steam 18 kts. easily.
Coal consumption averages 12 tons an hour at *full power*.

General Notes.—Built and engined by Vickers. Laid down 1899. Completed 1902. Blown up, September, 1905, but since raised and repaired. Fighting tops removed, 1905. It was intended (1907) to re-arm her as *Iwami*, but this was abandoned, and she was re-armed with modern guns as given above.



Mikasa (since reconstruction). *Taken May, 1908.*

Class distinctions.—The main feature of this ship is that the foremast is placed well abaft the chart house, etc. She is now rigged very like *Katori*, but is easily differentiated by the main mast.

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ひぜん **HIZEN** (October, 1900). (Reconstructed 1907-08.)

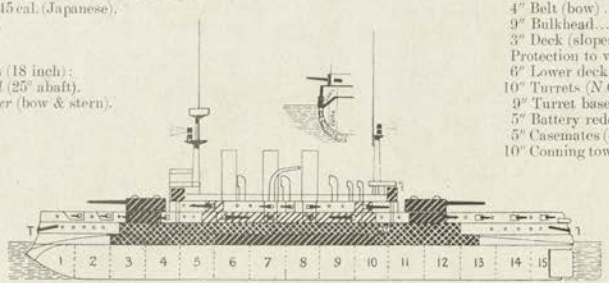
Displacement, 12,700 tons. Complement, 750.

Length (*waterline*), 376 feet. Beam 72 feet. *Maximum* draught, 28¼ feet.

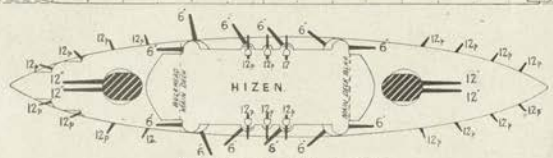
Guns:
4—12 inch, 40 cal. (*AAAA*) (Obachoff).
12—6 inch, 45 cal. (Japanese).
20—12 pdr.
20—3 pdr.
6—1 pdr.

Torpedo tubes (18 inch):
2 *submerged* (25° abaft).
2 *above water* (bow & stern).

Armour (Krupp):
9″ Belt (amidships).....*aa*
4″ Belt (bow).....*d*
9″ Bulkhead.....*aa*
3″ Deck (slopes).....
Protection to vitals.....=*aaa*
6″ Lower deck redoubt.....*a*
10″ Turrets (*N.C*).....*aa*
9″ Turret bases (*N.C*).....*aa*
5″ Battery redoubt (*N.C*)...*c*
5″ Casemates (4).....*c*
10″ Conning tower (*N.C*)...*aa*



Ahead:
2—12 in.
2—6 in.



Astern:
2—12 in.
2—6 in.

Broadside: 4—12 in., 6—6 in.

Machinery: 2 sets, 3 cylinder triple expansion. 2 screws. Boilers: 24 Niclausse. Designed H.P. 16,000 = 18 kts. Coal: *normal* 1016 tons; *maximum* 2000 tons.

Armour Notes.—Main belt is 7½ feet wide by about 250 feet long; 6 feet of it below waterline. Lower edge is about 5″ thick. The main belt has 9″ bulkheads. It is continued with thin armour to the bow.

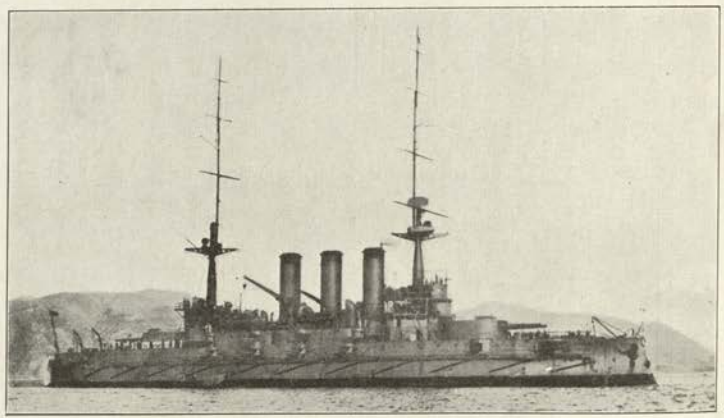
Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric, hydraulic, and hand. Big guns manœuvred electrically. Russian turrets to big guns.

Arcs of fire: Big guns 225°. The upper casemates about 120° from axial line. The end battery guns have no axial training. The battery wall stands well back from the side of the ship, the ports being sponsoned out. Arcs about 110° per gun.

Torpedo Notes.—Broadside *above water* tubes were originally fitted (section 10-11) but removed before completion.

Engineering Notes.—On first *trials* she made 17·75 kts. at 122 revolutions with a dirty bottom. On 12 hours *trial mean* I.H.P. 16,121 = 18·8 kts.

General Notes.—Torpedoed at Port Arthur 9/2/04. Subsequently repaired and greatly damaged in the Battle of Round Island. Scuttled at Port Arthur and raised September, 1905. Laid down at Cramp's Yard, Philadelphia, U.S.A. in 1898. Completed for sea, 1902. Cost about £1,000,000. Tactical diameter *circa* 550 yards.



ひさあ **ASAHI** (March, 1899) & まいきし **SHIKISHIMA** (November, 1898).

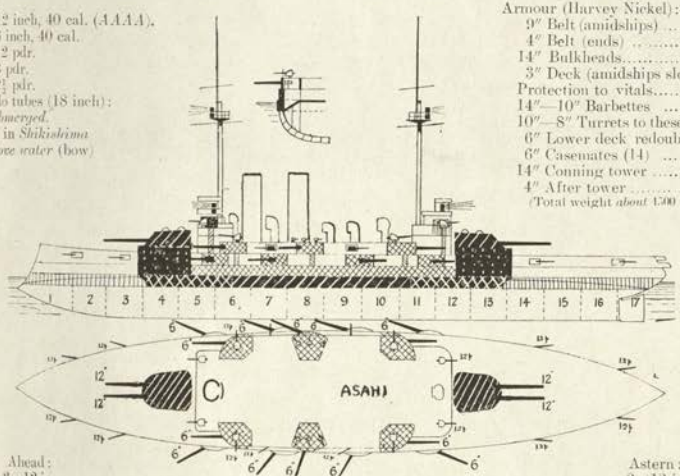
Normal displacement, 15,200 tons. Complement, 741.

Length (*waterline*), 415 feet. Beam, 76 feet. *Maximum* draught, 28¼ feet. Length *over all*, 425 feet.

Guns:
4—12 inch, 40 cal. (*AAAA*).
14—6 inch, 40 cal.
20—12 pdr.
8—3 pdr.
6—2½ pdr.

Torpedo tubes (18 inch):
4 *submerged*, with in *Shikishima*
1 *above water* (bow)

Armour (Harvey Nickel):
9″ Belt (amidships) .....*aa*
4″ Belt (ends) ..... *d*
14″ Bulkheads.....*aaa*
3″ Deck (amidships slopes)
Protection to vitals.....=*aaa*
14″—10″ Barbettes .....*aaa-aa*
10″—8″ Turrets to these =*aaa-a*
6″ Lower deck redoubt ... .. *b*
6″ Casemates (14) .... *b*
14″ Conning tower .....*aaa*
4″ After tower .... *d*
(Total weight *about* 1500 tons.)



Ahead:
2—12 in.
2—6 in.

Broadside: 4—12 in., 7—6 in.

Astern:
2—12 in.
2—6 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: 25 Belleville. Designed H.P. 15,000 = 18 kts. Coal: *normal* 700 tons; *maximum* 1400 tons.

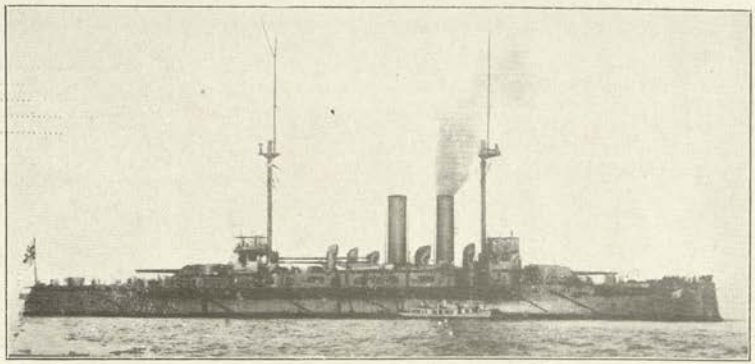
Armour Notes.—Main belt is 8½ feet: 6 feet of it below waterline. Upper belt is 250 feet long. Barbettes about main deck are *probably* only 10″ thick (*aa*) Deck slopes 3″ behind belt amidships, 1″ at barbettes, 2″ at ends.

Gunnery Notes.—Loading positions, big guns: all round, and any elevation, also in *Asahi*. Big guns manœuvred by steam and hydraulically. Electric, steam and hand hoists.
Arcs of fire: Big guns, 240°; casemates, about 120°.
Ammunition carried: 12 inch, 60 per gun; 6 inch, 200 per gun.
Height of guns above water: Turret guns, about 25 feet (high barbettes).

Torpedo Notes.—Bullivant net defence carried upper deck level. Partial defence only. 2 torpedo boats carried. *Shikishima* has 6 inch armour on her bow tube.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Refit.*	*Trials—At 12,500 H.P.*	*Trials—Full power*	*Boilers.*	*Present best speed.*
Asahi	Clydebank	Clydebank	July,'97	1901		12,957 = 17·5	16,360 = 18·3	Belleville	18·6
Shikishima	Thame's I. W.	Humphrys & T.	Jan.,'97	1900		12,874 = 17	16,907 = 18·78	Belleville	18·2

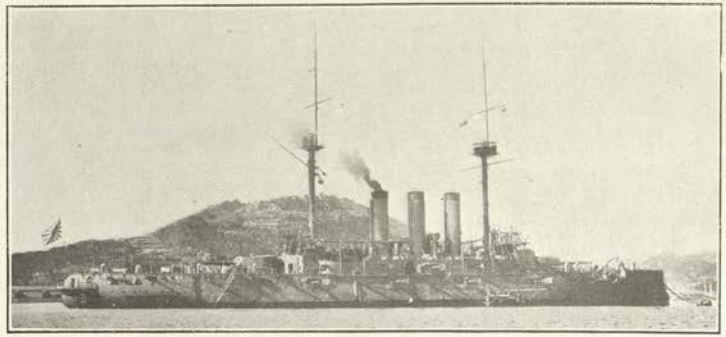
Coal consumption: *Asahi* was once a coal eater, but is now economical. Average about 12½ tons an hour at full power.
Weight of machinery, etc., 1335 tons. Heating surface, 37,936 square feet.
General Notes.—278 water-tight compartments.
The *Asahi* somewhat injured her frame by grounding on Southsea Beach on her way out. Fighting tops removed 1905.



ASAHI.

Differences.—
Class distinction.—*Asahi* is something like *Mikasa*, but easily distinguished from her because her fore funnel is much nearer fore mast than *Mikasa's*.

(see *Mikasa*.)



SHIKISHIMA.

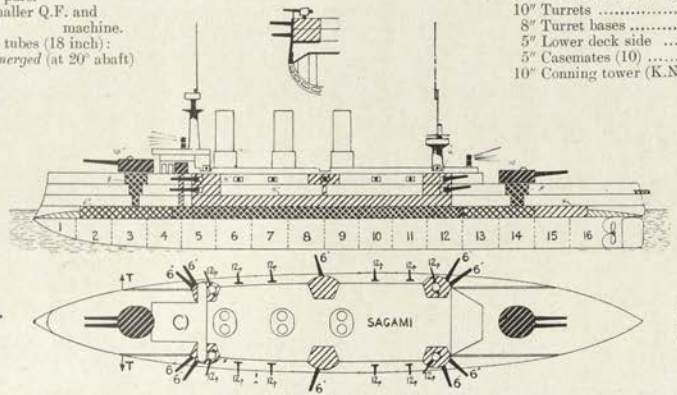
みださ **SAGAMI** (May, 1898), & **SUWO** (May, 1900). うめす

Normal displacement, (after reconstruction) 13,500 tons. Complement, 732.

Length (*waterline*) 424 feet. Beam, 71½ feet. *Maximum* draught, 27¼ feet. Length *over all*, 435 feet.

Guns (Obuchoff):
4—10 inch, 45 cal. (*AAAAA*)
10—6 inch, 45 cal.
16—12 pdrs.
26—Smaller Q.F. and machine.
Torpedo tubes (18 inch):
2 *submerged* (at 20° abaft)

Armour (*See Notes*):
9″—6″ Belt ..... *a-c*
2¾″ Deck (on slopes) .....
Protection to vitals .....= *aa*
10″ Turrets ..... *aa*
8″ Turret bases ..... *a*
5″ Lower deck side ..... *c*
5″ Casemates (10) ..... *c*
10″ Conning tower (K.N.C.) *aa*



Ahead:
2—10 in.
4—6 in.

Astern:
2—10 in.
4—6 in.

Broadside: 4—10 in., 5—6 in.

Machinery: 3 sets vertical 3 cylinder triple expansion. 3 screws. Boilers: 30 Bellevilles, placed fore and aft. Designed H.P. 14,500=19 kts. Coal: *normal* 1063 tons; *maximum* 2058 tons. Also liquid fuel.

Armour Notes.—Main belt is 7½ feet wide; 5 feet of it below waterline; lower edge is 9″ thick amidships.

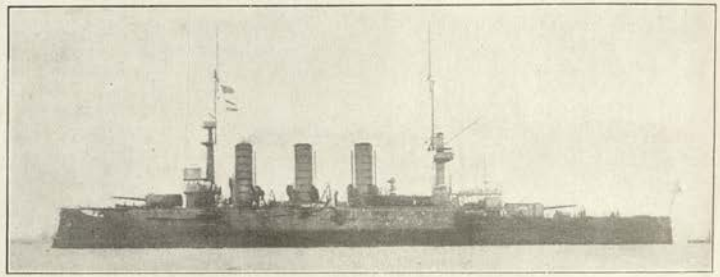
Sagami's belt stops short about 30 feet from bow and stern. Most of her armour is Harvey. The *Suwo's* is mostly K.C. Her belt is complete, the ends being 4 inch.

Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric all guns. Big guns manœuvred electrically. Bow: 6 inch formerly carried removed, otherwise no change in armament.
Arcs of fire: Big guns, 280°; secondary guns, 130°.
Ammunition carried: 12 in., 75 rounds per gun; 6 in., 200 rounds per gun. Height of guns above water: Bow turret, 30 feet; after turret, 22½ feet.

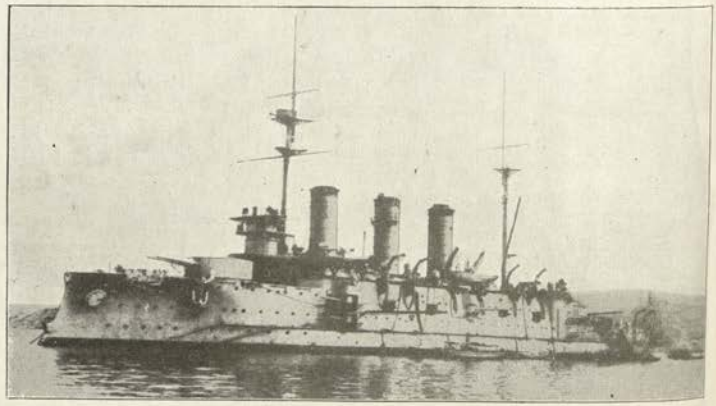
Torpedo Notes.—*Submerged* tubes 20° abaft the beam.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*First Trials.*	*Boilers.*	*Present best speed.*
Sagami	New Admiralty, St. Petersburg	Baltic Works	Nov.'95	1901	15,053=18·33 kts.	Belleville	
Suwo			Aug.' 98	1902	16,127=19·1 kts.	Belleville	

General Notes.—Original cost about £1,000,000 each. Tactical diameter about 700 yards. Scuttled during the war and salved 1905. Reconstructed 1908-09.



SAGAMI.



SUWO.

富士 FUJI (March, 1896).

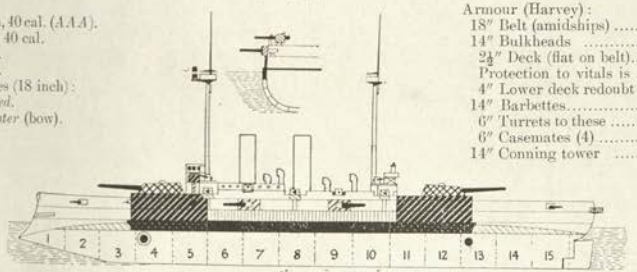
Displacement, 12,300 tons. Complement, 600.

Length (*waterline*), 390 feet. Beam, 73¾ feet. *Maximum* draught, 29 feet. Length *over all*, 412 feet. Length (*p.p.*), 374 feet.

Guns:
4—12 inch, 40 cal. (*AAA*).
10—6 inch, 40 cal.
16—12 pdr.
4—2½ pdr.

Torpedo tubes (18 inch):
4 *submerged*.
1 *above water* (bow).

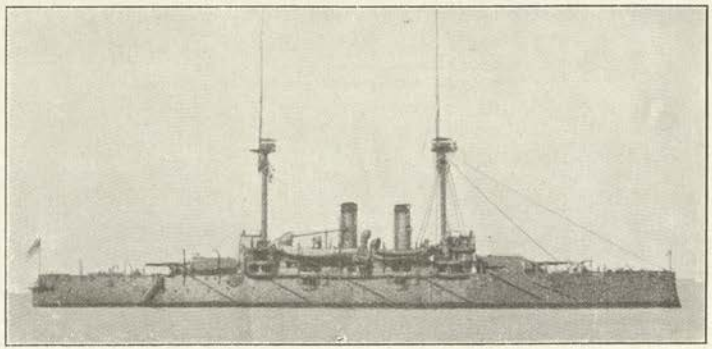
Armour (Harvey):
18″ Belt (amidships) ..... *.aaaa*
14″ Bulkheads ..... *aa*
2½″ Deck (flat on belt).....
Protection to vitals is .....*aaaa*
4″ Lower deck redoubt ..... *d*
14″ Barbettes..... *aa*
6″ Turrets to these .....= *a-c*
6″ Casemates (4) ..... *c*
14″ Conning tower ..... *aa*



Ahead:
2—12 in.
2—6 in.

Astern:
2—12 in.
2—6 in.

Broadside: 4—12 in., 5—6 in.



Machinery: 2 sets 4 cylinder vertical triple expansion. 2 screws. Boilers: Cylindrical. Designed H.P. *forced* 13,690=18 kts. Coal: *normal* 700 tons; *maximum* 1300 tons.

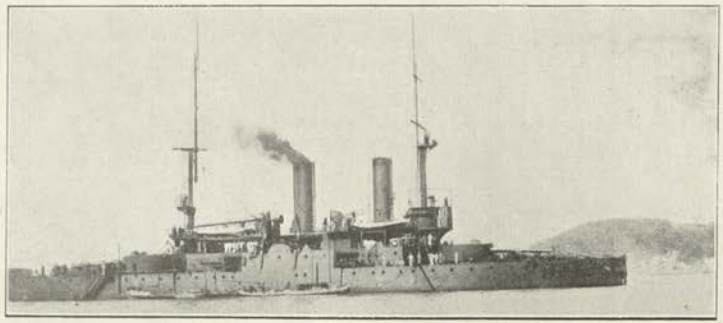
Armour Notes.—Belt is 7½ feet wide by 230 feet long; 5½ feet of it below waterline; lower edge is 8″ thick.

Gunnery Notes.—Loading positions, big guns: end on (but can load very slowly in other positions). Big guns manœuvred; hydraulic and steam.
Arcs of fire: Big guns, 250°.
Height of guns above water: Big guns about 21½ feet.

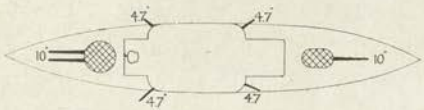
Torpedo Notes.—Tubes early pattern Elswick. Cannot deliver at speeds above 14 kts. Bullivant net defence.

Engineering Notes.—On first trial *Fuji* made 14,100=18·5, and *Yashima* reached 19 kts., but present speed does not exceed 15 kts. to any extent.

General Notes.—*Fuji* built at Thames Iron Works, *Yashima*, a sister, at Elswick. Laid down in 1894. *Yashima* (sister) sunk, having struck a mine, May, 1904, and foundered off Sasebo on her way back thither.

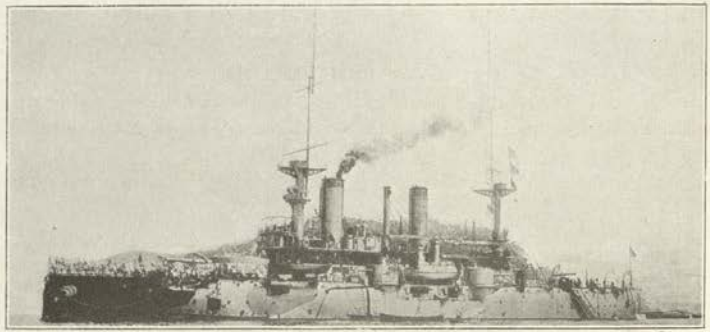


OKINOSHIMA (1896) & **まいみ MISHIMA** (1894). 4200 tons. 3—10 inch, 45 cal. (*AAA*). (*Mishima* has instead 4—9 inch *AA*) with, in both 4—4·7 inch, 10—3 pdrs., 12—1 pdr. Torpedo tubes, 4—18 inch (*above water*). Armour: 10″—8″ belt amidships. 8″ turrets. Designed H.P. 5700 = 16 kts. Cylindrical boilers. Coal: *maximum* 400 tons.



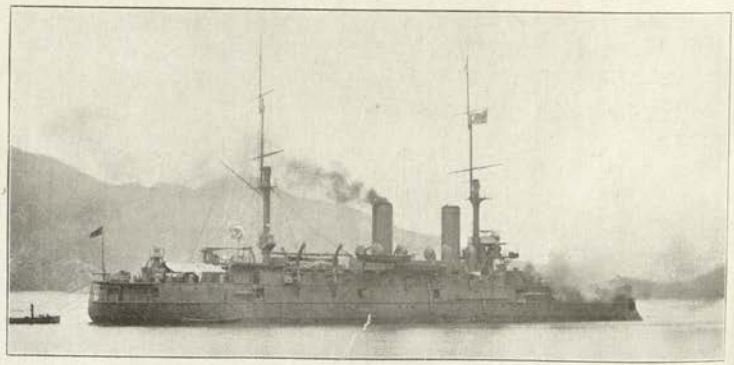
Okinoshima.

Mishima.



(Present appearance).

TANGO (Nov., 1894). Displacement 11,000 tons. Complement, 750. Length, 367 feet. Beam, 69 feet. *Maximum* draught, 28 feet. Guns (Obuchoff): 4—12 inch, 35 cal. (*AA*), 12—6 inch, 45 cal., and many 3 and 1 pdr. Armour (compound): Belt 15″ (partial). Turrets (steel) 10″, small turrets 5″. Designed H.P. 10,600 = 17 kts. Coal: *maximum* 1050 tons. Sunk at Port Arthur in the War 1904, salved in 1905.



きい **IKI** (Oct., 1889). Displacement 9670 tons. Sheathed. Armament: 2—old 12 inch (C), 4 old 9 inch, 7—6 inch, 20 light guns, 6—14 inch tubes (*above water*). Designed H.P. 8000 = 15·9 kts. Belleville boilers. Coal: 1200 tons.

んしつに **NISSHIN** (Feb., 1903) & **KASUGA** (Oct., 1902). かすか

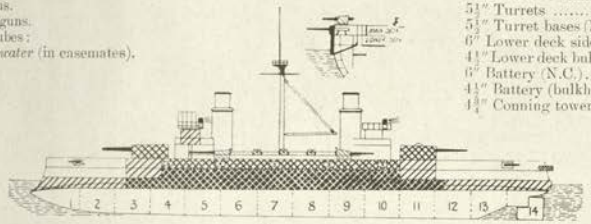
Displacement 7,750 tons. Complement 525.

Length (*waterline*), 357 feet. Beam, 61½ feet. *Maximum* draught, 25¼ feet.

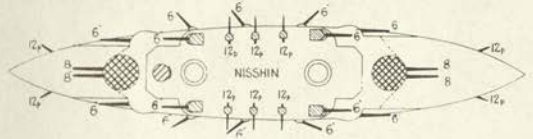
Guns:
4—8 inch, 45 cal. (*A*).
14—6 inch, 45 cal.
10—12 pdr.
6—3 pdrs.
2 Maxims.
2 Field guns.
Torpedo tubes:
4 *above water* (in casemates).

Armour (Terni):

6" Belt (amidships)	*a*
4½" Belt (ends)	*c*
1½" Deck (on slopes)	
Protection to vitals	*a*
5½" Turrets	*b*
5½" Turret bases (N.C.)	*c*
6" Lower deck side	*a*
4½" Lower deck bulkheads	*c*
6" Battery (N.C.)	*b*
4½" Battery (bulkheads)	*c*
4¾" Conning tower	*c*



Ahead:
3—6 in.
2—8 in.



Astern:
2—8 in.
4—6 in.

Broadside: 4—8 in., 7—6 in.

Machinery: 2 sets 3 cylinder vertical triple expansion. 2 screws. Boilers: 4 double ended, 4 single ended. Designed H.P. 13,500 = 20 kts. Coal: *normal*, 650 tons; *maximum* 1,100 tons.

Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric. Big guns manœuvred electrically.

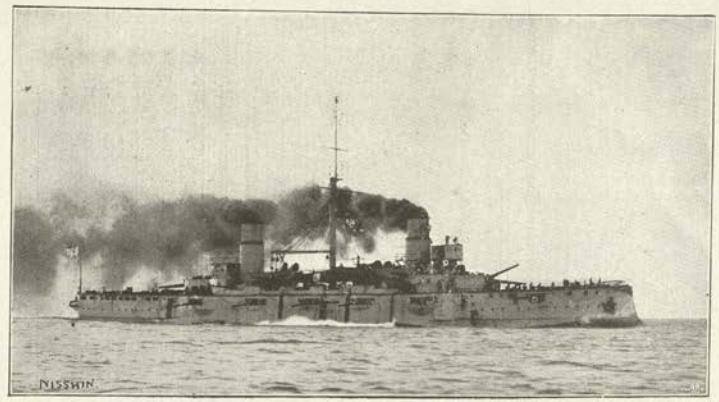
Kasuga formerly carried 2 –10 inch, but was altered. Height of turret guns above water: about 17 feet.

Torpedo Notes.—Torpedo tubes in casemates.

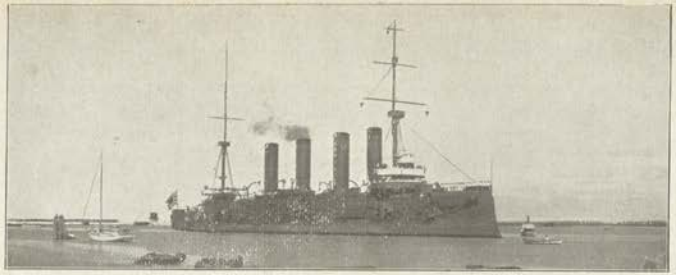
Engineering Notes.—Boilers are placed on either side of engine rooms. Coal consumption: large; nearly 14 tons an hour at 13,500 H.P. (20 kts.).

General Notes.—Laid down for Argentina in 1902. Purchased end of 1903 by Japan for £760,000. Reported to be very lightly built.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*	*Boilers*	*Best recent speed*
Nisshin	Ansaldo	Ans. Maudslay	May '02	Jan., '04		14,000=20	Cylindrical	18·5
Kasuga	Ansaldo	Ansaldo	Mar., '02	Jan., '04		=20	Cylindrical	19·8



NISSHIN (*Kasuga* identical.)

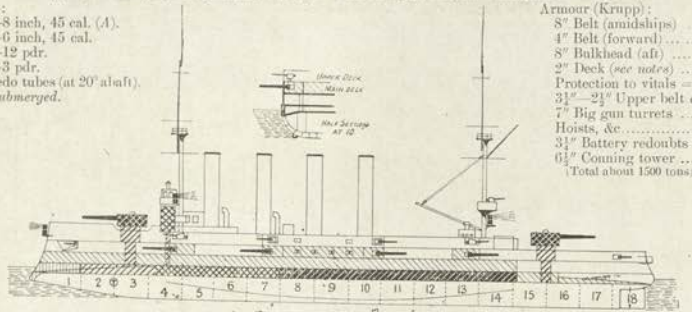


Photo, His Honour Mr. Justice Ballou.

そあ **ASO** (June, 1900). Displacement, 7800 tons. Complement, 500.
Length (*waterline*), 443 feet. Beam 55¾ feet. *Mean* draught, 22 feet. Length *over all*, 452 feet.

Guns:
2—8 inch, 45 cal. (*A*).
8—6 inch, 45 cal.
20—12 pdr.
7—3 pdr.
Torpedo tubes (at 20° abaft).
2 *submerged*.

Armour (Krupp):
8″ Belt (amidships) ...*aa*
4″ Belt (forward) ...*d*
8″ Bulkhead (aft) ...*aa*
2″ Deck (*see notes*) ...
Protection to vitals = *aaa*
3½″—2½″ Upper belt *e—f*
7″ Big gun turrets ...*a*
Hoists, &c. ...
3½″ Battery redoubts ...*e*
6½″ Conning tower ...*b*
(Total about 1500 tons).



Ahead:
1—8 in.
4—6 in.

Astern:
1—8 in.
4—6 in.

Broadside: 2—8 in., 4—6 in.

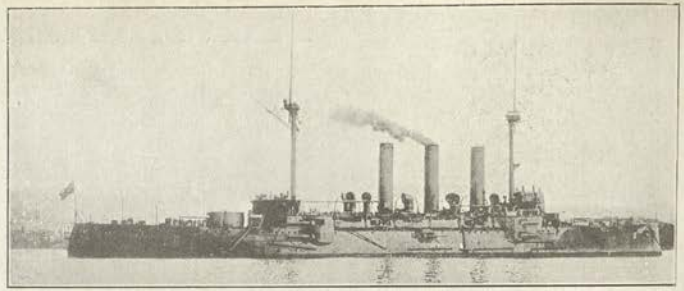
Machinery: 2 sets vertical cylinder triple expansion. 2 screws. Boilers: Miyabara. Designed H.P. 17,000 = 21 kts. Coal: *normal* 750 tons; *maximum* 1100 tons.

Armour Notes.—Main belt is 6½ feet wide, 4½ feet of it below water. There are two 2″ armour decks, the upper flat on main belt, the lower inclined. Coal between these decks and above them amidships.

Gunnery Notes.—Loading positions, big guns: all round. Hoists, electric and hand. Big guns manœuvred electrically and hand. Rate of fire, about 1 round per minute. Bow turret gun 28 feet above water; after-turret gun 24½ feet. Arcs of fire, 270°. Each 6 inch gun is mounted in a complete circular shield behind the battery wall. Arcs of fire about 110° from axial line. Rounds carried: 8 inch, 100 per gun; 6 inch, 150 per gun; 12 pdr., 250 per gun; 3 pdr., 500 per gun.

Engineering Notes.—This ship steamed excellently when new, exceeding the contract by a knot (I.H.P. 17,400 = 22 kts.) It is difficult to maintain high speed for very long in service, as the coal is not easy to get at. *Trial* consumption 1·4 lb. per I.H.P. per hour. In service, burned about 1·4 tons per hour at full power. Grate area, 137·8 square feet. Heating surface, 45,050 square feet.

General Notes.—Electric ventilation. No wood. Steel boats. Solid bulkheads reaching to main deck. Fighting positions in both turrets as well as in conning tower. Designed by M. Lagane, of La Seyne.

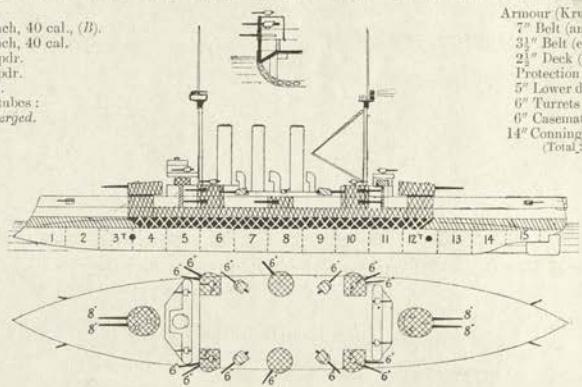


もつい (Asama Class—2 Ships.)

Idzumo. **IDZUMO** (September, 1899) & **IWATE** (March, 1900).
Displacement, 9800 tons. Complement, 483.
Length (*p.p.*), 400 feet. Beam, 68½ feet. *Maximum* draught, 24½ feet. Length *over all*, 434 feet.

Guns:
4—8 inch, 40 cal., (*B*).
14—6 inch, 40 cal.
12—12 pdr.
8—2½ pdr.
4 small.
Torpedo tubes:
4 *submerged*.

Armour (Krupp):
7″ Belt (amidship) ...*a*
3½″ Belt (ends) ...*i*
2½″ Deck (slopes) ...
Protection to vitals ...*aa*
5″ Lower deck (redoubt) *h*
6″ Turrets and bases ...*b*
6″ Casemates ...*k*
14″ Conning tower ...
(Total 2100 tons).



Ahead:
2—8 in.,
4—6 in.

Astern:
2—8 in.
4—6 in.

Broadside: 4—8 in., 7—6 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: Belleville. Designed H.P. 14,500 = 20·75 kts. Coal: *normal* 550 tons; *maximum* 1400 tons.

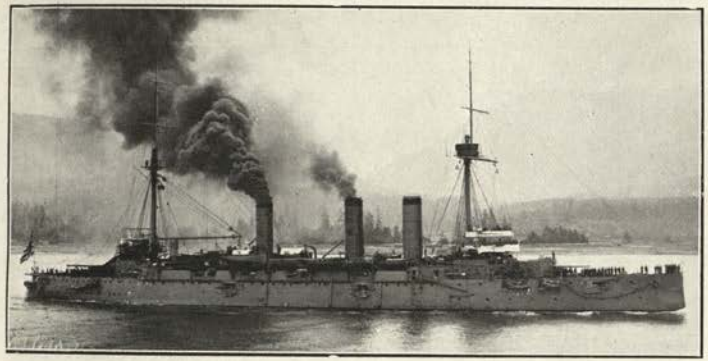
Armour Notes.—The belt is about 7 feet wide and thick part of it shortened to allow of K.C. instead of H.N.; 260 feet long. Upper belt 200 feet long. Deck 2½″ instead of 2″ as in *Asama*.

Gunnery Notes.—Guns load at any elevation or direction. Electric and hand gear and hoists.

Engineering Notes.—Both ships are excellent steamers. Coal consumption low in both, especially in *Idzumo*. Averages 10½ tons an hour at 15,000 H.P., and 8 tons at 10,000 H.P.

General Notes.—Both built at Elswick. Bullivant net defence fitted.

Name.	*Builder.*	*Machinery*	*Laid down.*	*Completed.*	*Refit.*	*First Trials.*	*Boilers*	*Best recorded speed.*
Idzumo	Elswick	Humphrys & T.	'98	1901		15,739 = 22·01	Belleville	20·5
Iwate	Elswick	Humphrys & T.	'99	1901	1906	17,500 = 21·8	Belleville	21·5



AZUMA (1899).

Photo by favour of G. Blackaby, Esq.

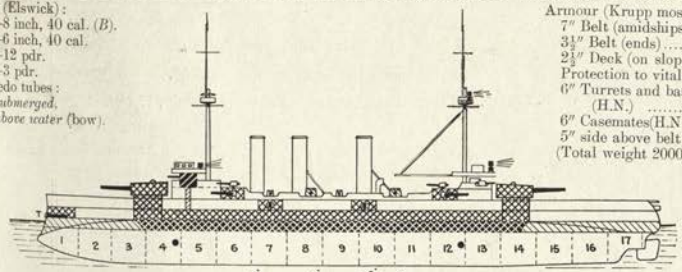
Displacement, 9456 tons. Complement, 482.

Length (*waterline*), 430 feet. Beam, 59 feet. *Maximum* draught, 25 feet. Length *over all*, 446 feet.

Guns (Elswick):
4—8 inch, 40 cal. (*B*).
12—6 inch, 40 cal.
12—12 pdr.
12—3 pdr.

Torpedo tubes:
4 *submerged*.
1 *above water* (bow).

Armour (Krupp mostly):
7″ Belt (amidships) ... *a*
3½″ Belt (ends) ..... *e*
2½″ Deck (on slopes)...
Protection to vitals =*aa*
6″ Turrets and bases (H.N.) ..... *b*
6″ Casemates (H.N.) ... *b*
5″ side above belt ..... *b*
(Total weight 2000 tons).



Ahead:
2—8 in.
2—6 in.

Astern:
2—8 in.
2—6 in.

Broadside: 4—8 in., 6—6 in.

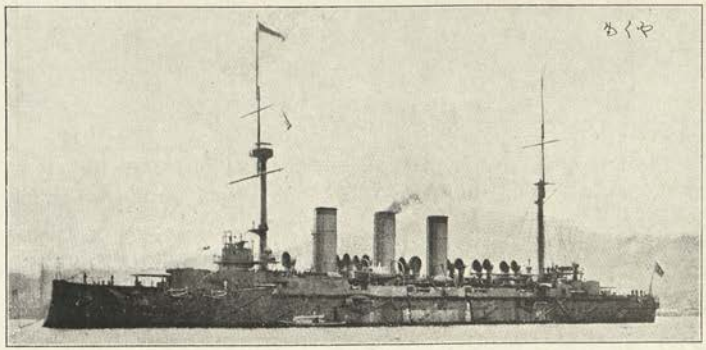
Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: Belleville. Designed H.P. 17000 = 20 kts. Coal: *normal* 600 tons; *maximum* 1300 tons.

Armour Notes.—Main belt is 7 feet wide by 210 feet long with 6″ bulkheads.

Gunnery Notes.—As for *Asama*, etc. *Engineering Notes.*—Made on *trial* 18,000 I.H.P. = 21 kts.

Torpedo Notes.—Bullivant net defence.

General Notes.—This ship generally resembles the *Yakumo*, but the upper deck guns are disposed somewhat differently. Built at St. Nazaire.



YAKUMO (1899).

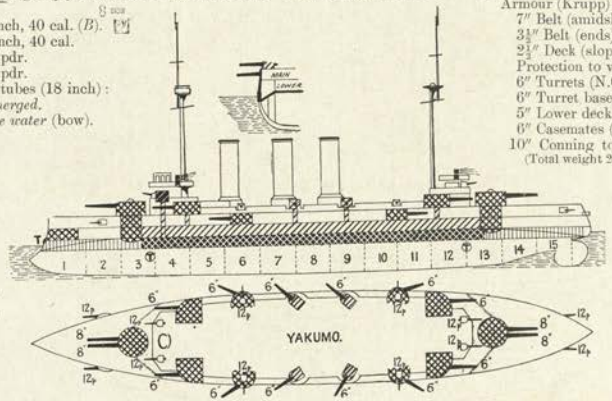
Displacement, 9,850 tons. Complement, 500.

Length (*p.p.*), 390 feet. Beam, 65¼ feet. *Mean* draught, 23¾ feet. Length *over all*, 434 feet.

Guns:
4—8 inch, 40 cal. (*B*).
12—6 inch, 40 cal.
12—12 pdr.
7—2½ pdr.

Torpedo tubes (18 inch):
4 *submerged*.
1 *above water* (bow).

Armour (Krupp):
7″ Belt (amidships) *a*
3½″ Belt (ends)..... *de*
2½″ Deck (slopes)...
Protection to vitals =*aa*
6″ Turrets (N.C.).... *b*
6″ Turret bases (N.C.) *b*
5″ Lower deck side *e*
6″ Casemates (8) ... *b*
10″ Conning tower *aa*
(Total weight 2040 tons).



Ahead:
2—8 in.
2—6 in.

Astern:
2—8 in.
2—6 in.

Broadside: 4—8 in., 6—6 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: Belleville. Designed H.P. 15,000 = 20 kts. Coal: *normal* 550 tons; *maximum* 1,300 tons. *Armour Notes:* Belt is 7 feet wide.

Gunnery Notes: Hoists, electric for all guns. Big guns, electric and hand gear.

Arcs: Big guns, 250°; secondary, about 110°. Ammunition: 8 in., 80 rounds per gun; 6 in., 150 per gun.

Torpedo Notes.—Bullivant net defence.

Engineering Notes: On trial I.H.P. 15,500 = 20·7 kts. Coal consumption: about 5 tons an hour at 7,000 H.P. and about 12¾ tons an hour at 15,000 H.P. (20 kts.)

General Notes: Laid down at Vulkan Co., Stettin, September 1897; completed 1901.

2 c

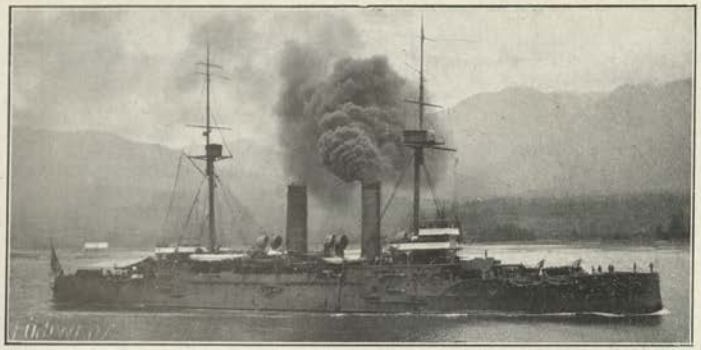


Photo by favour of G. Blaskaby, Esq.

まさあ (Asama.) はきと (Tokiwa) has the standard compass on a platform.
(Asama Class—2 Ships).

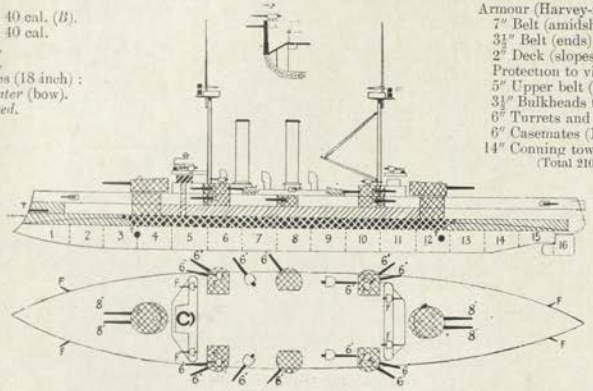
ASAMA (March, 1898) & **TOKIWA** (July, 1898).

Displacement 9750 tons. Complement 500.

Length (*waterline*), 408 feet. Beam, 67 feet. *Maximum* draught, 24½ feet.

Guns:
4—8 inch, 40 cal. (*B*).
14—6 inch, 40 cal.
12—12 pdr.
7—2½ pdr.
Torpedo tubes (18 inch):
1 *above water* (bow).
4 *submerged*.

Armour (Harvey-nickel):
7″ Belt (amidships) ..... *a*
3½″ Belt (ends) ..... *c*
2″ Deck (slopes) .....
Protection to vitals ..... *aa*
5″ Upper belt (amidships) ... *c*
3½″ Bulkheads to it ..... *d*
6″ Turrets and bases ..... *b*
6″ Casemates (10) ..... *b*
14″ Conning tower ..... *aaa*
(Total 2100 tons).

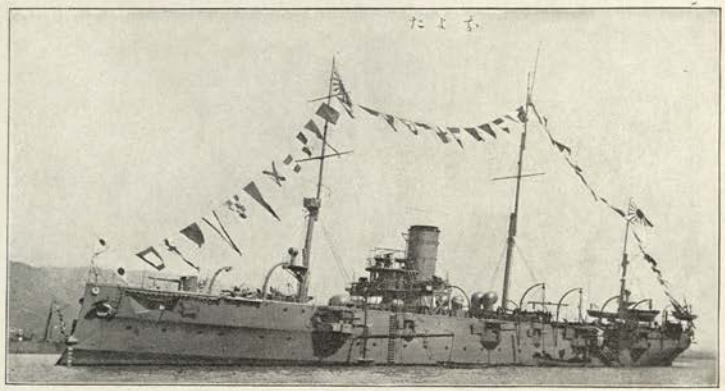


Ahead:
2—8 in.
4—6 in.

Astern:
2—8 in.
4—6 in.

Broadside: 4—8 in., 7—6 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. *forced* 18,000 =21½ kts. Coal: *normal* 550 tons; *maximum* 1300 tons.
Armour Notes.—Belt 7 ft. wide; thick part 280 ft. long. Upper belt 7 ft. wide by 260 ft. long. 3″ hoists to casemates.
Gunnery Notes.—8 in. guns load at any elevation or direction. Electric hoists. Big guns electrically manœuvred.
Engineering Notes.—Machinery by Humphrys & Tennant. *Asama* on *trial* reached 23 kts. (22 kt. *mean*): *Tokiwa*, a *mean* of 23 kts. Neither ship can touch this now, and the utmost made by *Asama* in the war was 19 kts., and that rarely. Requires re-boilering. Coal consumption: about 10½ tons an hour at 10,000 H.P. about 20 tons at *full power*. *General Notes.*—Both built at Elswick. Very 'handy' ships. Bullivant net defence fitted.



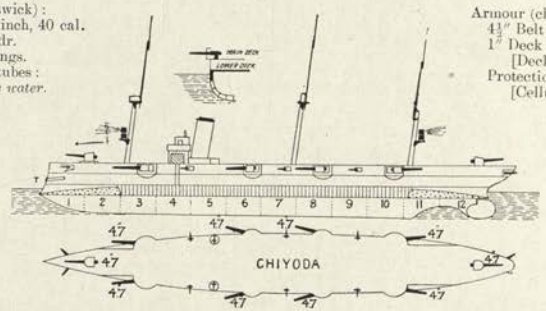
たよち **CHIYODA** (June, 1890).

Displacement 2450 tons. Complement 350.

Length, 308 feet. Beam, 43 feet. *Maximum* draught, 17 feet.

Guns (Elswick):
10—4·7 inch, 40 cal.
15—3 pdr.
3 Gatlings.
Torpedo tubes:
3 *above water*.

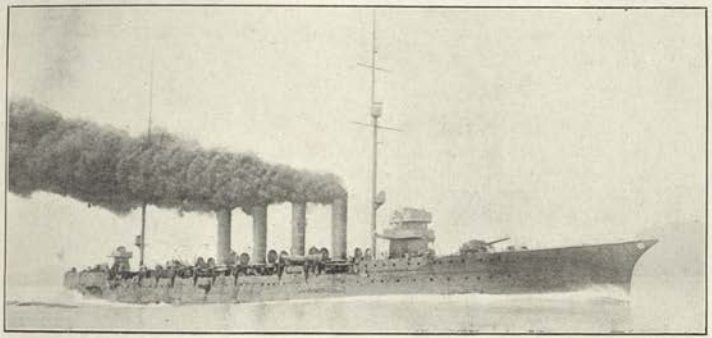
Armour (chrome steel):
4½″ Belt ..... *d*
1″ Deck at ends .....
[Deck flat on belt.]
Protection to vitals is ... *d*
[Cellulose belt.]



Machinery: 2 sets triple expansion. 2 screws. Boilers (1898): Belleville without economisers. Designed H.P. 5500=19 kts. Coal: *normal* 330 tons; *maximum* 420 tons.

Notes.—Built at Clydebank. Originally had locomotive boilers, and was given Bellevilles as the old boilers choked up with Japanese coal. Burns about 6 tons an hour at full speed.

JAPANESE SECOND CLASS CRUISERS (23 knot).

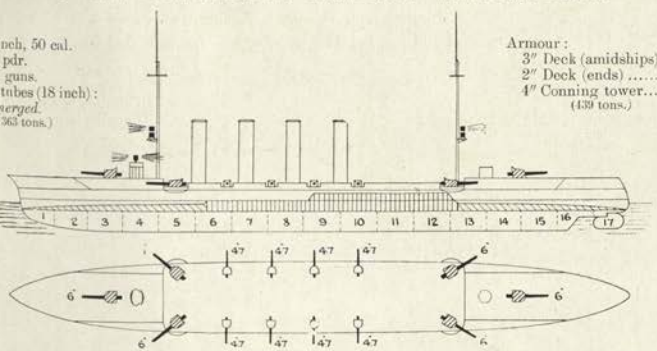


とらひ HIRATO (June, 1911). きはや YAHAGI (Oct., 1911). まくち CHIKUMA (March, 1911).

Normal displacement 5040 tons. Complement 392.
Length (*p.p.*), 440 feet; *o.a.*, 475 feet. Beam, 43¾ feet. *Mean* draught, 16½ feet.

Guns:
6—6 inch, 50 cal.
8—12 pdr.
2 field guns.
Torpedo tubes (18 inch):
2 *submerged*.
(363 tons.)

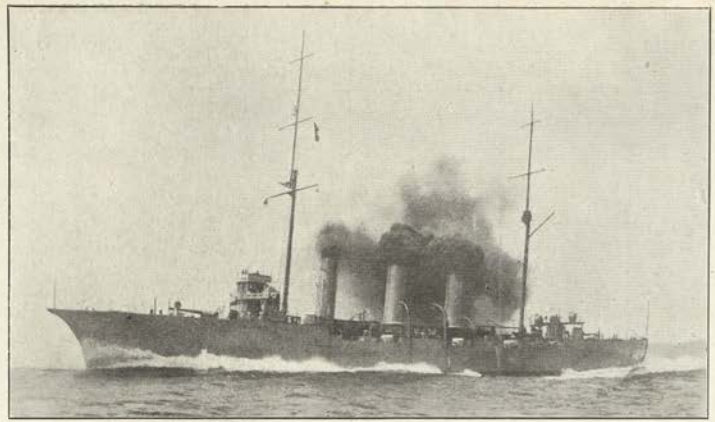
Armour:
3″ Deck (amidships)... = *d*
2″ Deck (ends)..... = *e*
4″ Conning tower..... *d*
(439 tons.)



Machinery: Curtis turbines: except *Chikuma*, Parsons' turbine. 4 screws. Boilers: Miyabara. Designed H.P. 22,500 = 26 kts. Coal: *normal* 500 tons; *maximum* 1000 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Hirado *Yahagi* *Chikuma*	Kawasaki Co. Mitsu Bishi Sasebo Yard	Mitsu Bishi	1909	*To be* 1912		Miyabara in all.	

Weight of hull, etc., 2278 tons.

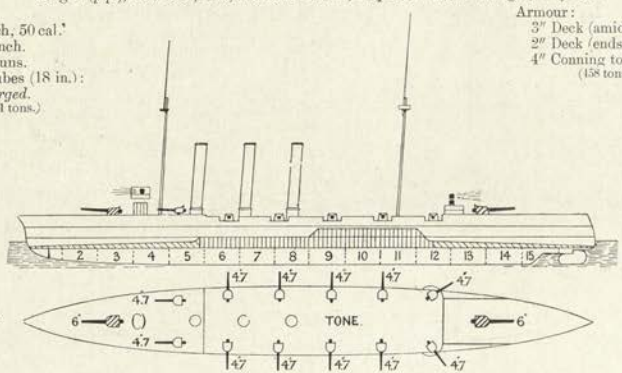


ねと TONE (Oct., 1907).

Normal displacement 4105 tons. Complement 392.
Length (*p.p.*), 360 feet; *o.a.*, 403 feet. Beam, 47¼ feet. *Mean* draught, 16¾ feet.

Guns:
2—6 inch, 50 cal.
12—4·7 inch.
2 field guns.
Torpedo tubes (18 in.):
2 *submerged*.
(261 tons.)

Armour:
3″ Deck (amidships) = *d*
2″ Deck (ends) ..... = *e*
4″ Conning tower ... *d*
(158 tons.)



Ahead:
1—6 in.
2—4·7 in.

Astern:
1—6 in.
2—4·7 in.

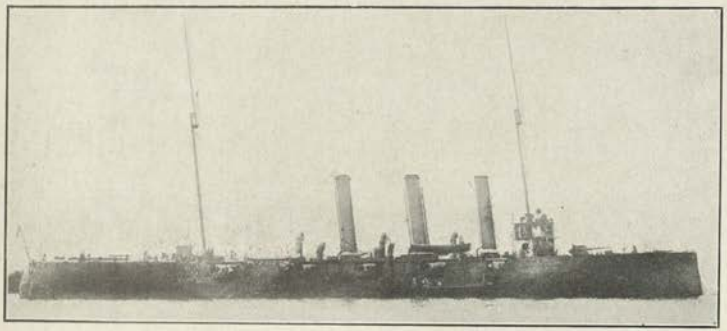
Broadside: 2—6 in., 6—4·7 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 16 Miyabara. Designed H.P. 15,00 = 23 kts. Coal: *normal* 300 tons; *maximum* 750 tons.

Name.	*Builder*	*Machinery*	*Laid down.*	*Completed*	*Refit*	*Trials*	*Boilers*	*Best recent speed.*
Tone	Sasebo	Mitsu Bishi Co.	Sept.,'05	1909			Miyabara	

Weight of hull, etc., 1778 tons.

JAPANESE SECOND CLASS CRUISERS (20 knot).



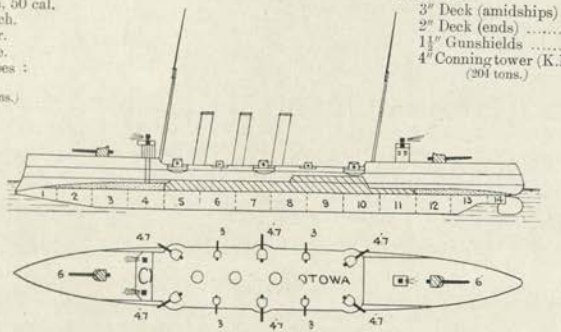
はとち OTOWA (Nov., 1903).

Displacement, 3000 tons. Complement, 312.

Length, (*o.a.*), 341 feet; *p.p.*, 321½ feet. Beam, 41½ feet. *Mean* draught, 15¾ feet.

Guns (Japanese):
2—6 inch, 50 cal.
6—4·7 inch.
4—12 pdr.
2 Machine.
Torpedo tubes:
Nil.
(199 tons.)

Armour:
3″ Deck (amidships) = *e*
2″ Deck (ends) ..... = *e*
1½″ Gunshields .....
4″ Conning tower (K.N.C.)
(204 tons.)

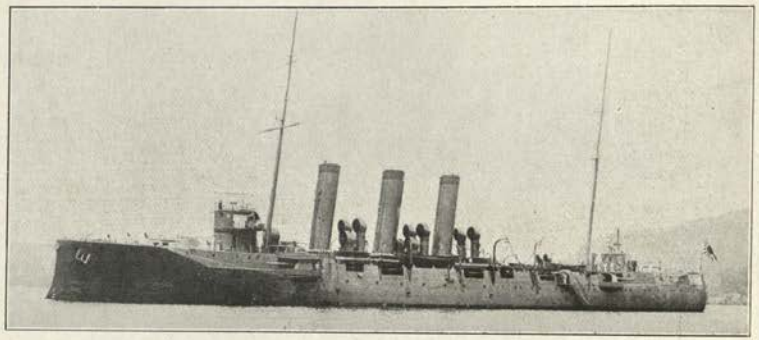


Ahead:
1—6 in.
2—4·7 in

Astern:
1—6 in.
2—4·7 in.

Broadside: 2—6 in., 3—4·7 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: Miyabara. Designed H.P. 10,000 = 21 kts. Coal: *normal* 600 tons; *maximum* 850 tons. Laid down at Yokosuka, 1903.
Weights: hull and fittings, 1399 tons; machinery, 803 tons.



にいたか NIITAKA. ましつ TSUSHIMA.

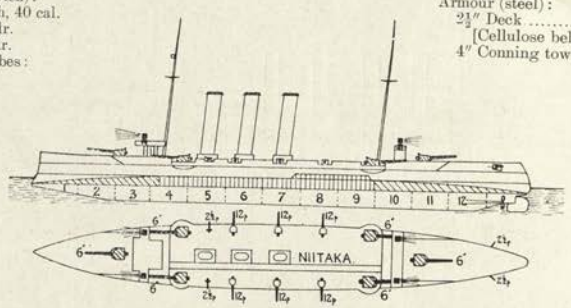
NIITAKA (1902), & **TSUSHIMA** (Dec., 1902).

Displacement, 3420 tons. Complement, 320.

Length, 334½ feet. Beam, 44 feet. *Maximum* draught, 16½ feet.

Guns (Elswick):
6—6 inch, 40 cal.
10—12 pdr.
4—2½ pdr.
Torpedo tubes:
None.

Armour (steel):
2½″ Deck ..... = *d*
[Cellulose belt.]
4″ Conning tower (K.N.C.) *d*

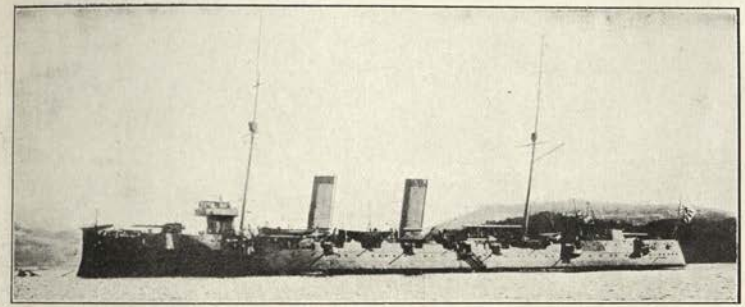


Ahead:
3—6 in.

Astern:
3—6 in.

Broadside: 4—6 in.

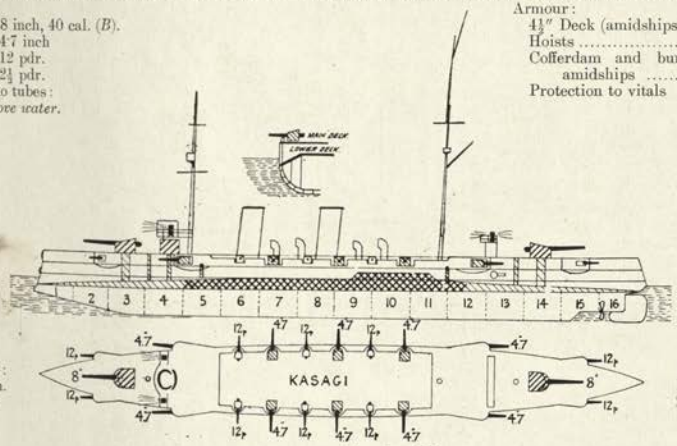
Machinery: 2 sets triple expansion. 2 screws. Boilers: Niclausse. Designed H.P. 9500 = 20 kts. Coal: *normal* tons; *maximum* 600 tons. Laid down 1900 at Yokosuka and Kure.



KASAGI きさか (January, 1898), & **CHITOSE** ちとせ (January, 1898).
Displacement 4760 tons. Complement 405.
Length (*waterline*), 396 feet. Beam, 48 feet. *Maximum* draught, 24½ feet. Length *over all*, 405 feet.

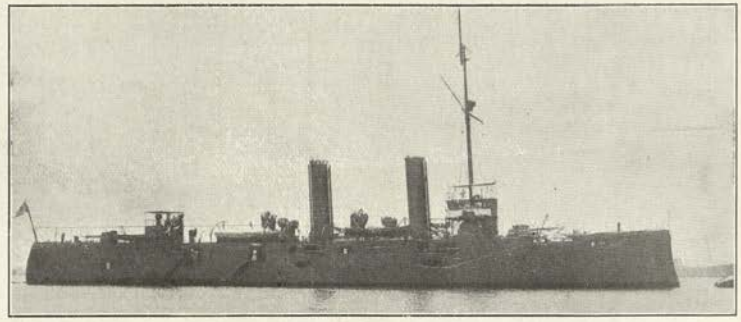
Guns:
2—8 inch, 40 cal. (*B*).
10—4·7 inch
12—12 pdr.
6—2½ pdr.
Torpedo tubes:
4 *above water*.

Armour:
4½″ Deck (amidships) ... = *b*
Hoists ..... = *e*
Cofferdam and bunkers amidships .....
Protection to vitals ..... = *b*



Broadside: 2—8 in., 5—4·7 in.
Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: now Miyabara. Designed H.P. *forced* 15,000 = 22·5 kts. Coal: *normal* 350 tons; *maximum capacity* 1000 tons.

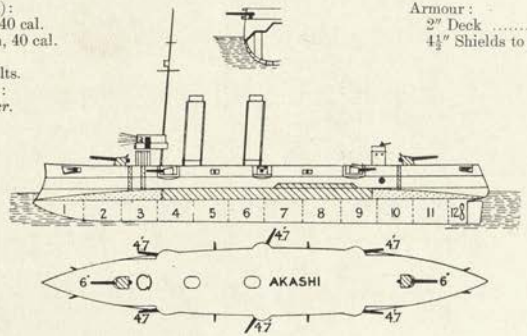
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*First trials (mean)*	*Boilers*	*Best recent speed*
Kasagi	Cramp	Cramp	1896	Augs.'99	'04	13,492 = 22·7	Miyabara	22
Chitose	Union Ironw'ks	U. Ironworks	1896	Dec., '99	'05	15,500 = 22·87	Miyabara	23



AKASHI あかし (1897).
Displacement 2700 tons. Complement 275.
Length, 305 feet. Beam, 41 feet. *Maximum* draught, 16⅓ feet.

Guns (Elswick):
2—6 inch, 40 cal.
6—4·7 inch, 40 cal.
12—3 pdr.
4 Nordenfelts.
Torpedo tubes:
2 *above water*.

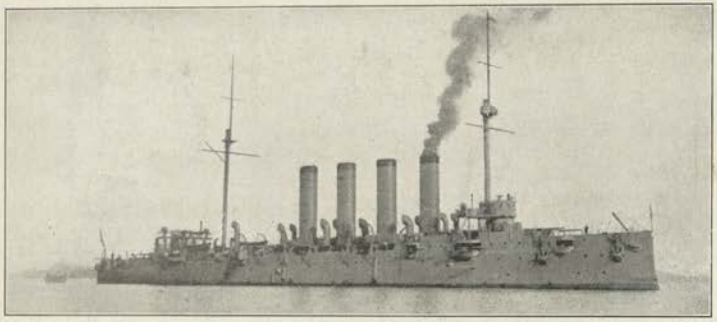
Armour:
2″ Deck ..... = *e*
4½″ Shields to 6 inch guns



Broadside: 2—6 in., 3—4·7 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: 8 cylindrical. Designed H.P 8500 = 20 kts. Coal: *normal* 200 tons; *maximum* 600 tons.

Notes.—Both ships designed and built in Japan. They were intended to have been sisters, but the *Suma* proving very wet, the *Akashi* was built up amidships and other modifications introduced.



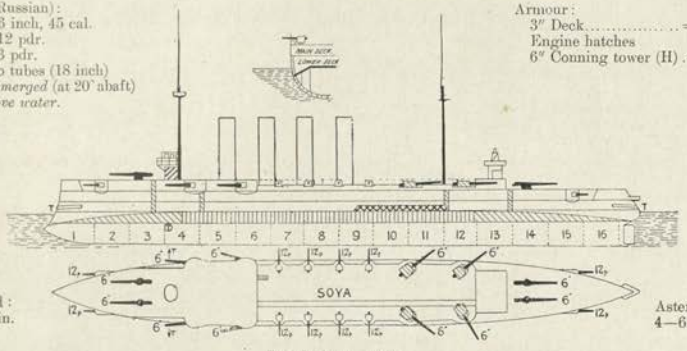
やうえ **SOYA** (Oct., 1899).

Displacement, 6500 tons. Complement, 571.

Length (*waterline*), 416 feet. Beam, 52 feet. *Maximum* draught, 21 feet.

Guns (Russian):
12—6 inch, 45 cal.
12—12 pdr.
6—3 pdr.
Torpedo tubes (18 inch)
2 *submerged* (at 20° abaft)
2 *above water*.

Armour:
3″ Deck.....=*d*
Engine hatches
6″ Conning tower (H) ...*e*



Ahead: 4—6 in.

Astern: 4—6 in.

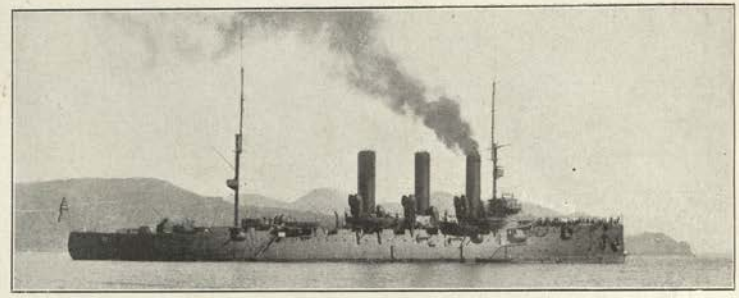
Broadside: 6—6 in.

Machinery: 2 sets 4 cylinder vertical inverted triple expansion. 2 screws. Boilers: ('07) Miyabara. Designed H.P. 20,000=23 kts. Coal: *normal* 770 tons; *maximum* 1250 tons.

Engineering Notes.—Funnels 90 feet high above bars. Heating surface, 62,229 square feet.

First *trials*: 100 revs.=16 kts. 120 revs.=19 kts. 140 revs.=22 kts. 154=23 kts.
12 hours, 149 revs. H.P. 16,270=23·25 kts. 8 hours, 160 revs. H.P. 20,000=24·6 kts.
Actual radius about 950 miles at full speed; 4500 miles at 10 kts.

General Notes.—Sunk at Chemulpo during the Russo-Japanese War, February, 1904. Salved, August, 1905. Laid down at Cramp's, Philadelphia, May, 1898. Completed for sea early in 1901.



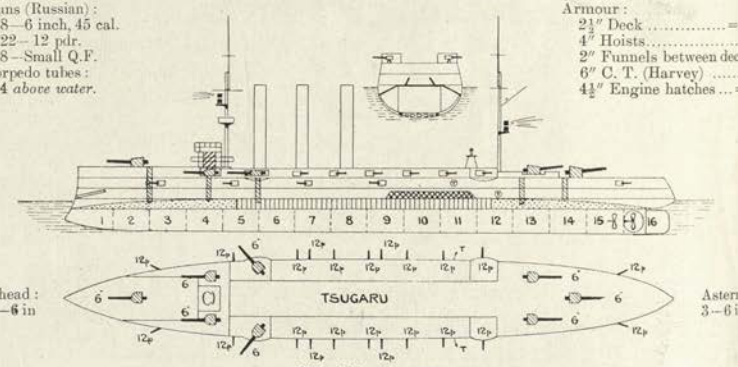
つがる **TSUGARU** (Aug., 1899).

Displacement 6630 tons. Complement 570.

Length (*waterline*), 410 feet. Beam, 55 feet. *Maximum* draught, 21¼ feet. Length *over all*, 416 feet.

Guns (Russian):
8—6 inch, 45 cal.
22—12 pdr.
8—Small Q.F.
Torpedo tubes:
4 *above water*.

Armour:
2½″ Deck .....=*d*
4″ Hoists.....
2″ Funnels between decks
6″ C. T. (Harvey) ..... *c*
4½″ Engine hatches ...=*b*



Ahead: 3—6 in

Astern: 3—6 in.

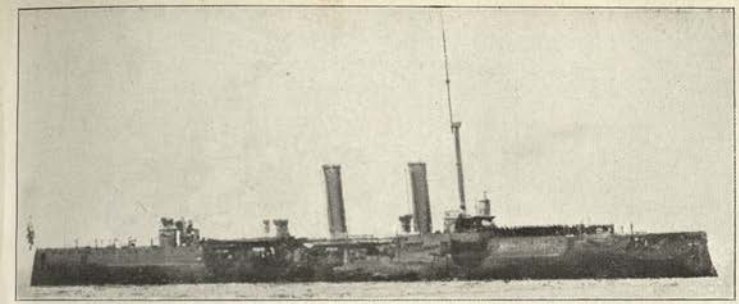
Broadside: 5—6 in.

Machinery: 3 sets horizontal 3 cylinder triple expansion. 3 screws. Boilers: 24 Belleville. Designed H.P. 11,600=20 kts. Coal: *normal* 900 tons; *maximum* 1430 tons + liquid fuel.

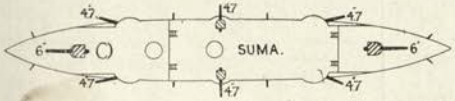
Gunnery Notes.—Electric hoists to all guns.

General Notes.—Sunk at Port Arthur, October, 1904. Salved August, 1905. Tactical diameter *circa* 750 yards. No wood used in construction.

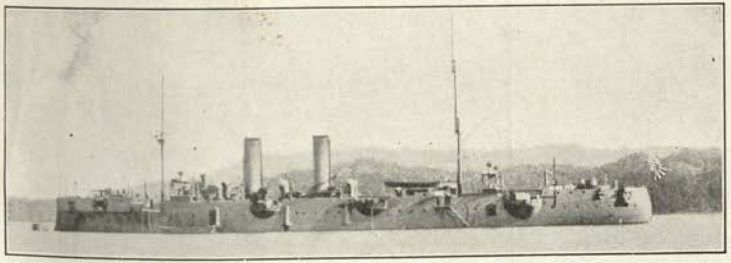
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*First trials*	*Boilers*	*Best recent speed*
Tsugaru	Galernii Island	Baltic Works	1896	1902	1907	13,100=19·2	Belleville	18



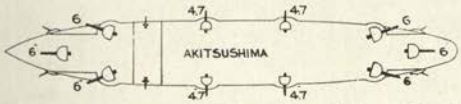
ます **SUMA** (1895). 2657 tons. Comp. 275. Dimensions: 305×41×(*Max.*) 16 feet. Armament (Elswick): 2—6 inch, 40 cal., 6—4·7 inch, 40 cal., 12—3 pdr. 2 tubes. 2″ Deck. 4½″ Shields to 6 inch guns.



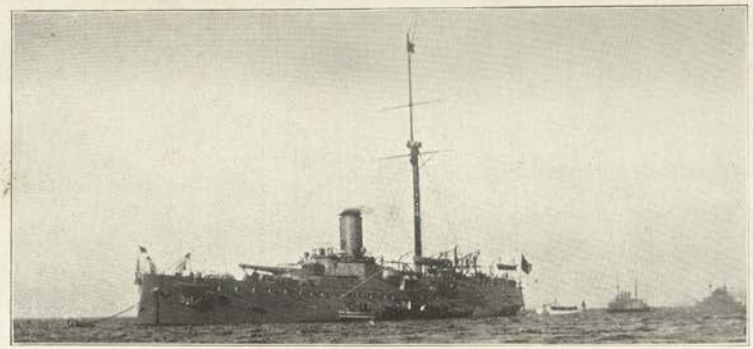
Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: 8 cylindrical. Designed H.P. *forced* draught 8500=20 kts. Coal: *normal* 200 tons; *maximum* 544 tons.



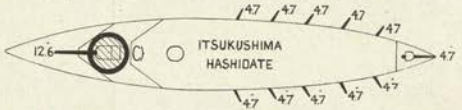
まきつしま **AKITSUSHIMA** (1892). 3150 tons. Comp 330. Dimensions, 302×43×(*Max.*) 18½ feet Armament: 4—6 inch, 6—4·7, 10—3 pdr. 4—14 inch tubes. 3″ Deck.



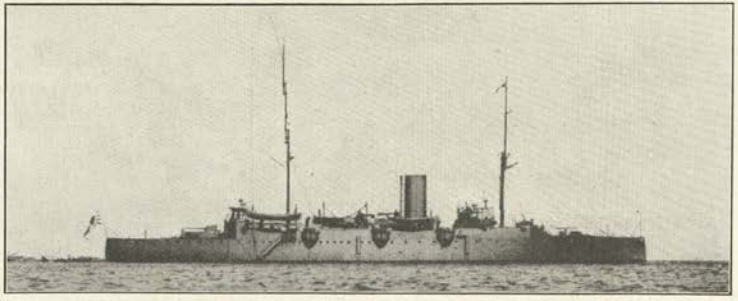
Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. *natural* =16 kts.; *forced* 8400=19 kts. Coal: *normal* 500 tons.



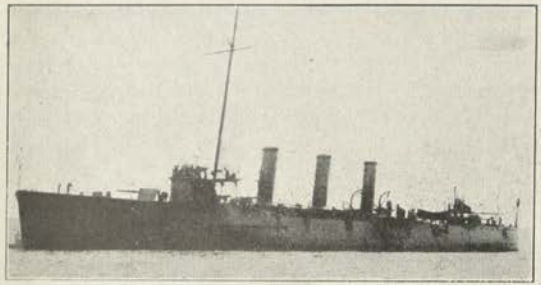
まいくつしま **ITSUKUSHIMA** (1889), & てたては **HASHIDATE** (1891). 4277 tons. Comp. 360. Dimensions: 295×50½×(*Max.*) 21¼ feet. Armament: 1—12·6 Canet, 11—4·7, 5—12 pdr., 11—3 pdr., 2 M., 4—14 in. tubes. Armour (steel): 12″ Barbette with 4″ shield, 1½″ deck.



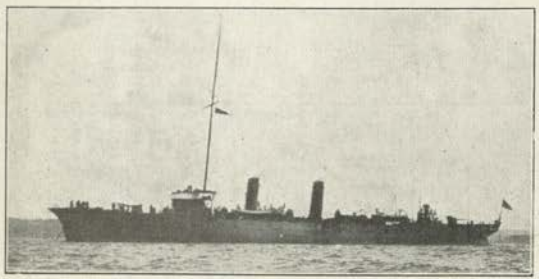
Machinery: 2 sets triple expansion. 2 screws Boilers: *Hashidate*, Miyabara (1903); *Itsukushima*, Belleville (1900-01). Designed H.P. 5400=16·7 kts. Coal: 405 tons.



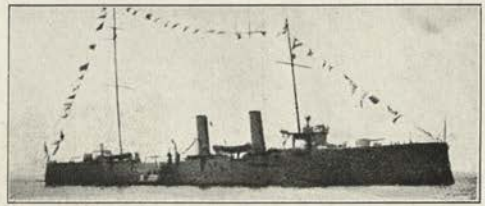
ほおか高 **TAKACHIHO** (1885). 3700 tons. Comp. 357. Dimensions: 300×46×(*Max.*) 20 feet. Armament: 8—6 inch, 40 cal., 2—6 pdr., 14 machine, 4—14 inch tubes. Armour: 3″ deck. Machinery: Designed H.P. 7000=18·5 kts. After refit (1900), *Naniwa* made 17·8 kts. *mean natural* draught. Coal: *normal* 350 tons; *maximum* 800 tons.



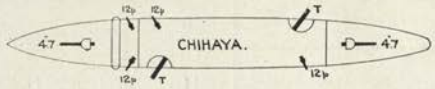
MOGAMI (1907). 1329 tons. Comp. 178. Guns: 2—4·7 inch, 4—12 pdr. Machinery: Parsons turbine. Designed H.P. 8000= 23 kts. Boilers: 6 Miyabara. Coal: *normal*, tons; *maximum*, tons.

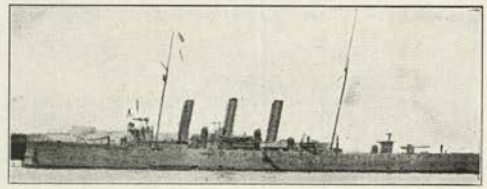


よど **YODO** (1907). 1230 tons. Comp. 177. Guns: 2—4·7 inch, 50 cal., 4—12 pdr. Machinery: 2 sets 4 cyl. triple expansion. Designed H.P. 6500=22 kts. Boilers: 4 Miyabara. Coal: *normal*, tons; *maximum* tons.

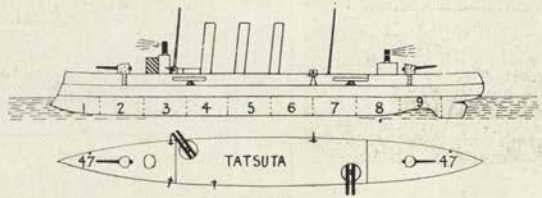


やはち **CHIHAYA** (1901). 1250 tons. Comp. 125. Guns: 2—4·7 inch, 4—12 pdr. 3—18 inch tubes. Designed H.P. 6000= 21 kts. Boilers: Thornycroft. Coal: *normal* 200 tons; *maximum* 250 tons.





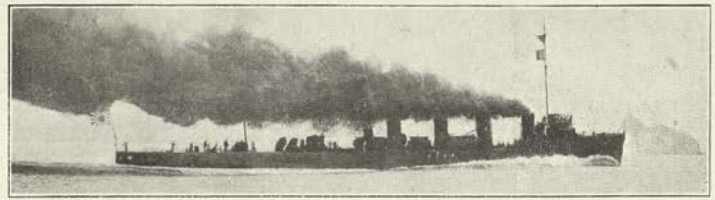
たつた **TATSUTA** (1894). 875 tons. Comp. 100. Guns: 2—4·7 inch, 4—3 pdr. 2—14 inch tubes. Machinery: 2 sets triple expansion. 2 screws. Boilers (1904): Miyabara. Designed H.P. 5500=21 kts. Coal: *normal* tons; *maximum* 188 tons.



54 + 2 JAPANESE DESTROYERS. Boats over 1000 tons are officially rated first class; 1000—600, second class; and under 600 tons, third class.

Totals.	Class.	Date.	Displacement.	H.P.	*Max.* Speed.	Coal.	Complement.	Tubes. 18 in.	*Max.* Draught.
2	*New* (Y)	'12—'14	838	22,000	... *t*	...	...	...	...
2	*Sakura*	'11—'13	600	18,000	33*t*	...	...	2	...
1	*Umikaje*	'09—'11	1100	21,000	35*t*	...	123	3	...
1	*Umikaje*	'08—'10	1100	21,000	35*t*	...	123	3	...
37	*Arare*	'05—'08	380	6000	29	90	70	2	11
4	*Asashiho* (T)	'01—'04	365	6000	31	90	60	2	9¾
2	*Akebono* (Y)	'97—'00	306	6000	31	95	55	2	9½
6	*Kagero* (T)	'97—'00	275	5400	30	81	54	2	...
1	*Yamahiko* (Y)	'00—'02	303	5000	27	80	...	2	10¼

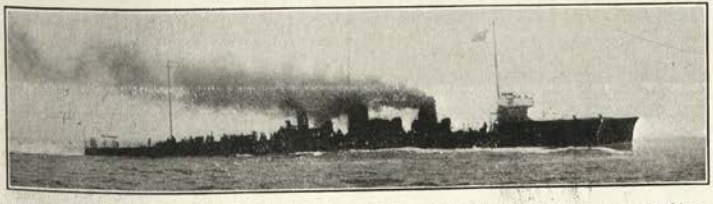
(T) = Thornycroft. (Y) = Yarrow type. *t* = Turbine.

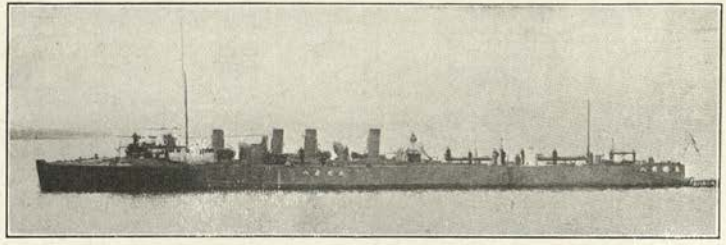


Umikaje (1910 and **Yamikaje** (1911). Armament: 2—4 inch, 5—12 pdr., 3—18 inch tubes. Parsons turbine.

Building in England. (Yarrows.)

2 New boats. 838 tons. 260 × 27¼ feet. H.P. 22,000, including internal combustion engines of 1000 S.H.P.



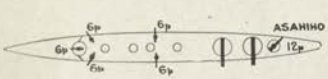


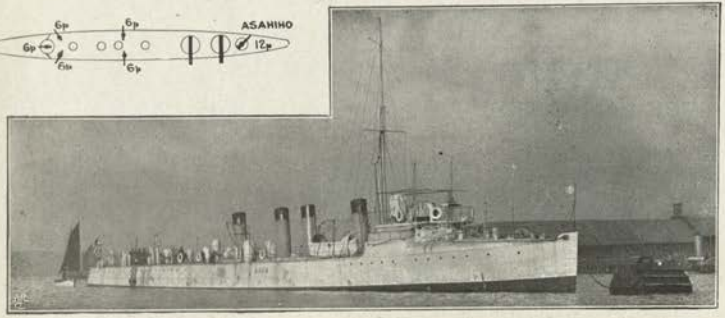
The 37 *Arare* type are named:—**Arare, Ariake, Asakase, Asatsuyu, Fubuki, Fumitzuki, Hayakase, Hatsuharu, Hatsushimo, Hibiki, Hatsuyuki, Harukaze, Kisaragi, Kamikaze, Kikutsuki, Minatsuki, Mikazuki, Matsukase, Nagatsuki, Nowake, Nenohi, Oite, Shiratsuyu, Shirayuki, Shirotaye, Satsuki, Shigure, Utsuki, Ushio, Wakaba, Yugure, Yayoi, Yudachi, Yunagi.** Also **Ajanami, Iranami, Uranami** ('08.)

Armament: 4—12 pdr. 2—18 inch tubes.

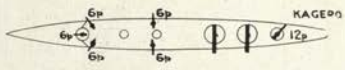
H² *Sakura* class:—**Sakura, Taschibana.** Armament: 2—4 inch, 4—14 pdr., 2—18 inch tubes. Parsons turbine.

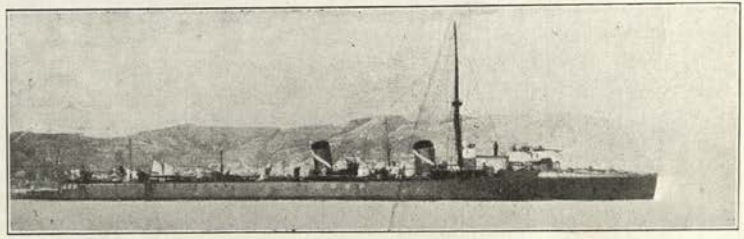
JAPANESE DESTROYERS.



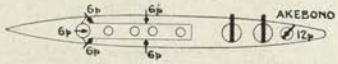


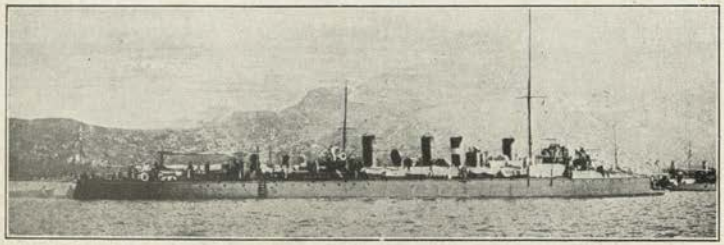
The 4 *Asashiho* (Thornycroft) type:—***Asashiho, Asagiri, Murasame, Shirakumo.***
Armament: 1—12 pdr. (*aft*), 5—6 pdr.



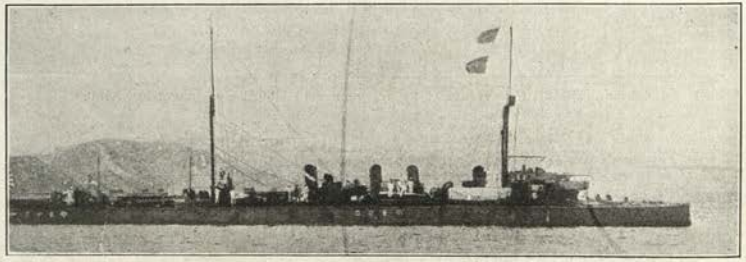


The 6 *Kagero* (Thornycroft) type:—***Kagero, Murakumo, Shinonome, Shiranui, Usugumo, Yugiri.***
Armament: 1—12 pdr. (*aft*), 5—6 pdr.





The 2 *Akebono* (Yarrow) type:- ***Akebono, Oboro.*** Armament: 1—12 pdr. (*aft*), 5—6 pdr.

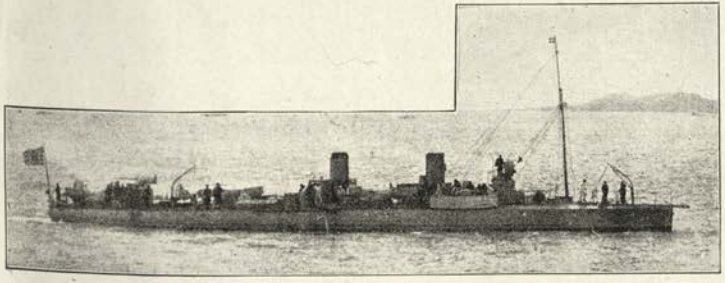


Yamahiko. Armament: 1 –12 pdr. (*aft*), 5—3 pdr. 2—18 inch tubes.

55 Torpedo Boats.

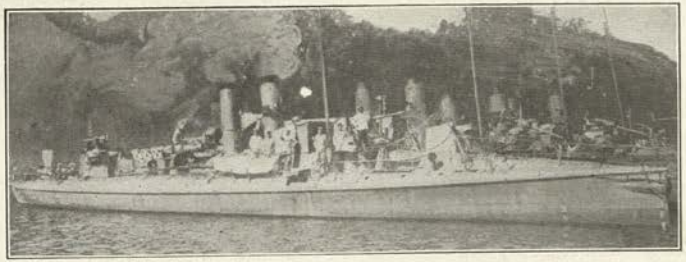
No.	Type.	Date.	Displacement. *about*	*Maximum* Speed.	Coal.	Complement.	Tubes.
	First class			kts.	tons.		
16	Aotaka	'03-'05	120	27	25	...	3
5	Hayabusa	'98-'01	150	29	30	...	3
	Second class						
14	75—62 (Y)	'02-'01	82	24	...	20	3
11	49—31 (S)	'00	82	24	...	...	3
4	43—39 (Y)	'00	110	24	...	...	3
2	30—29 (N)	'98	87	26	...	...	3
8	*various*	'98	55	21	...	...	2

Many of the boats were built in Japan, following with slight variations, Yarrow (Y), Schichau (S), or (N) Normand types.

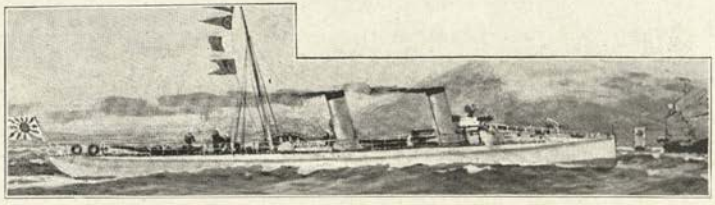


The *Aotaka* class are named **Aotaka Hato, Hibari, Kari, Kiji, Tsubame, Sagi, Uzura, Kamome Hashitaka,** and **Otori,** all built in Japan. Armament: 1–6 pdr., 2–3 pdr. 3–18 inch tubes. Normand type.

Hayabusa are the **Hayabusa, Kasasagi, Shirataka, Manazuru, Chidori,** all built in Japan. Normand type. Armament: 1—6 pdr., 2—3 pdr. 3—18 inch tubes.

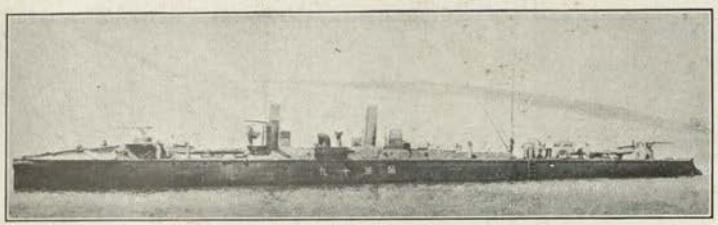


14 boats: Nos. **75—62.** Armament: 2—3 pdr., 3—18 inch tubes. Yarrow type.

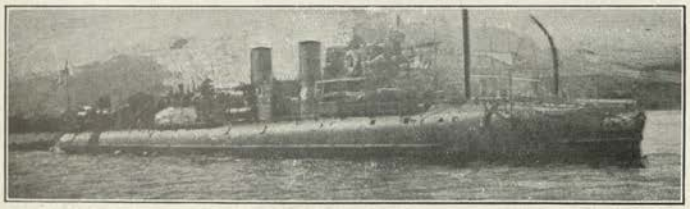


11 boats: **49, 47—44, 38—36, 33—31.** Armament: 1—3 pdr., 3 tubes. Schichau type.

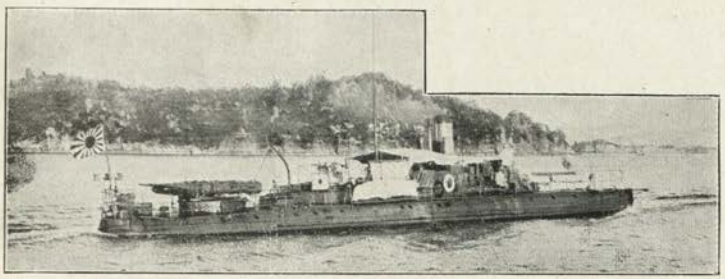
JAPANESE TORPEDO FLOTILLA.



4 Yarrow boats: ***43, 41–39.*** Armament: 2 -3 pdr., 3 tubes. H.P. 2,000.



2 Normand boats: ***30*** *&* ***29*** (1898). Dimensions: 121½ × 13½ × 5 feet. Armament: 1–3pdr., 3 tubes.



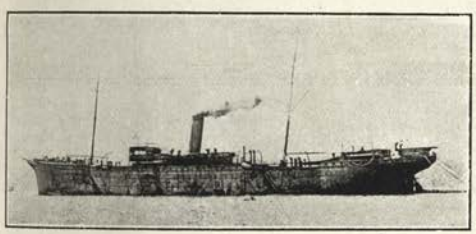
8 old boats. Mostly armed with 1–3 pdr, and 2 tubes.

15 + 2 Submarines.

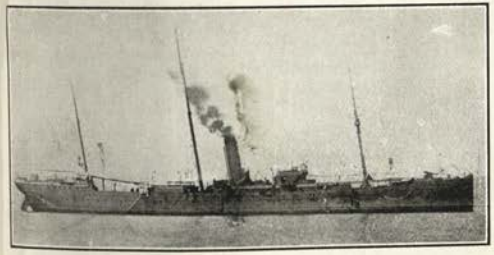
No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. Tubes	*Max.* draug't
			tons		kts.	tons.			feet
2	*New* Schneider (16, 17)	'12–'14	520	2100	17·5	...	..	6	...
3	13, 14, 15	'11–'12	350	...	...	...	...	...	...
3	10, 11, 12	'09–'11	...	...	...	...	...	...	...
2	Vickers C type (8, 9)	'07–'08	314	600	13			2	
2	Japanese (6–7)	'06	85	180	8			1	
5	Elementary Holland (1–5)	'04	125	160	9			1	
				70	7				

The 5 Hollands were imported from the U.S.A. about the time of the war with Russia.

Torpedo Depot Ships.



KARASAKI (*ex Ekaterinoslav*) (1896). 10,500 tons. H.P. 3200 = 13 kts.

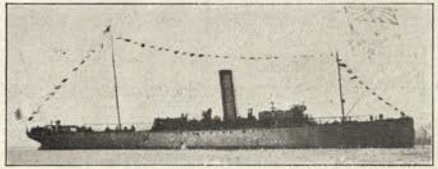


TOYOHASHI. 4200 tons.

Hospital Ships.

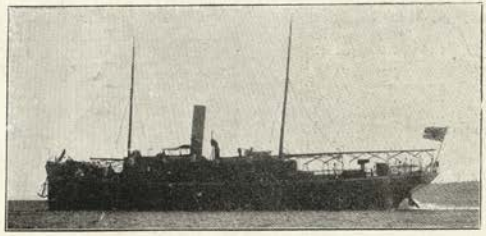
HAKUAI & **KOSAI** (MARUS), each 2400 tons. Ships of the Nagasaki-Shanghai line, are detailed for this service. *Max.* capacity: *about* 300 invalids each.

Despatch Vessels.



MANSHU (*ex Manchuria*), & **MATSUE.** Speed, 14 kts.

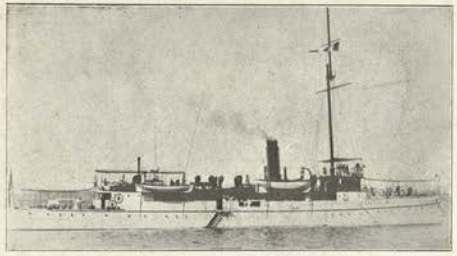
Training Service.



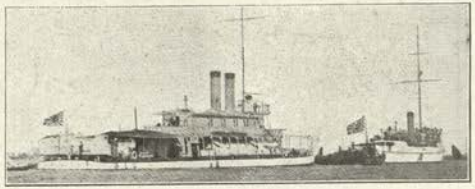
YURAGAWA MARU. Engineers' training ship.

(Most of the old protected cruisers are used for training.)

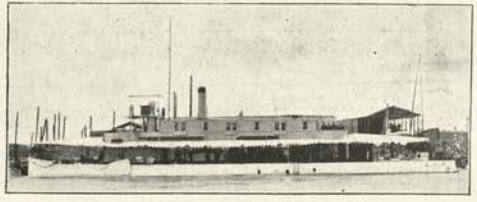
River, etc., Gunboats.



UJI (1903). 620 tons. 190×27½×6 feet. Armament: 4—12 pdr. H.P. 1000 = 13 kts. Belleville boilers.



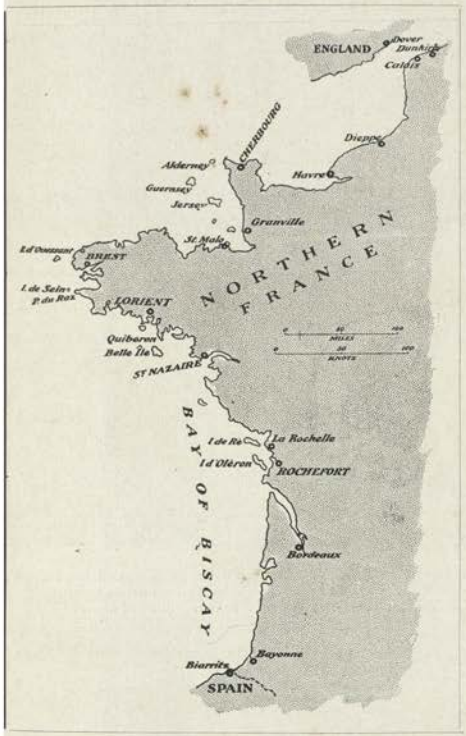
FUSHIMI (1906). 180 tons. 160×24½×2½ feet. Guns: 2—6 pdr. 4 M. Speed: 14 kts. Yarrow boilers. (*Yarrow type.*)
Also **TOBA** (1911). 250 tons. Larger edition of above.



SUMIDA (1903). 132 tons. 145×24×2 feet. Guns: 2—6 pdr. 4 M. Speed: 15 kts. Thornycroft boilers. (*Thornycroft type.*)

FRENCH FLEET.

Officially revised by order of the Minister of Marine in 1912.



CHERBOURG

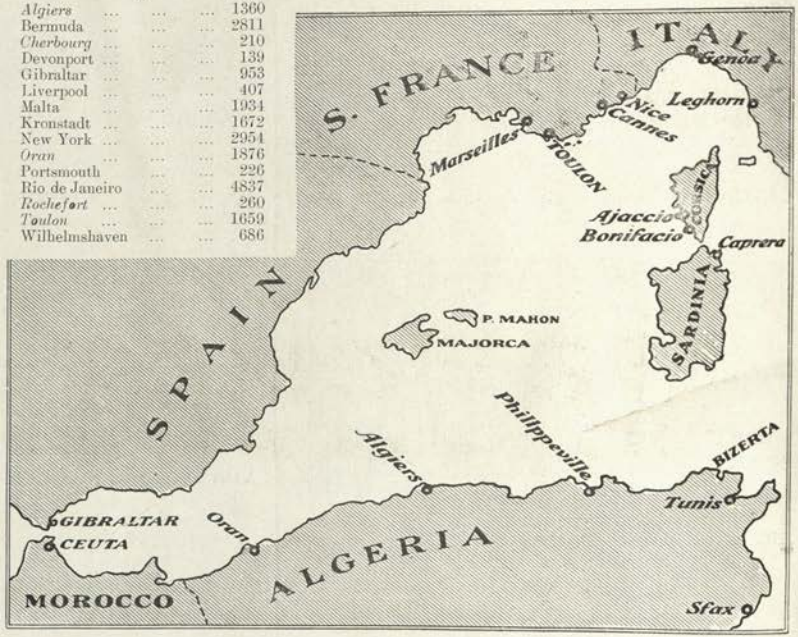
	to	knots.
Bermuda	... ...	2933
Brest	... ...	210
Copenhagen	... ...	834
Devonport	... ...	111
Dunkirk	... ...	180
Lorient	... ...	300
Kronstadt	... ...	1500
Portsmouth	... ...	72
Rochefort	... ...	410
Stockholm	... ...	1258
Toulon	... ...	1817
Wilhelmshaven	... ...	476

TOULON

	to	knots.
Aden	... ...	2882
Ajaccio	... ...	160
Algiers	... ...	405
Bizerta	... ...	450
Brest	... ...	1659
Constantinople	... ...	1356
Genoa	... ...	164
Gibraltar	... ...	713
Kronstadt	... ...	3289
Lorient	... ...	1656
Port Mahon	... ...	207
Malta	... ...	612
Naples	... ...	407
Oran	... ...	542
Port Said	... ...	1485
Portsmouth	... ...	1864
Saigon	... ...	7150
Sevastopol	... ...	1654
Spezia	... .	195
Tangiers	... ...	738
Taranto	... ...	766

BREST.

	to	knots.
Algiers	... ...	1360
Bermuda	... ...	2811
Cherbourg	... ...	210
Devonport	... ...	139
Gibraltar	... ...	953
Liverpool	... ...	407
Malta	... ...	1934
Kronstadt	... ...	1672
New York	... ...	2954
Oran	... ...	1876
Portsmouth	... ...	226
Rio de Janeiro	... ...	4837
Rochefort	... ...	260
Toulon	... ...	1659
Wilhelmshaven	... ...	686



ORAN (Torpedo Station).

	to	knots.
Algiers	... ...	400
Bizerta	... ...	650
Gibraltar	... ...	225
Toulon	... ...	542

BIZERTA.

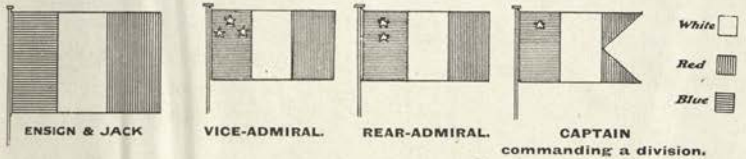
	to	knots.
Algiers	... ...	400
Gibraltar	... ...	875
Malta	... ...	240
Oran	... ...	650
Spezia	... ...	430
Toulon	... ...	450

SAIGON.

	to	knots.
Hong Kong	... ...	930
Manila	... ...	875
Port Arthur	... ...	2065
Singapore	... ...	640

MERCHANT FLEET: 1,300 steamers and 1,400 sailers.
MERCANTILE MARINE: Total steam tonnage, 836,617 net.
" sail " 447,617 "
COINAGE: 1 franc (100 centimes) = 9½*d.* British, 19 cents American.
TRADE PORTS (in order of importance): Marseilles, Havre, Dunkirk, Bordeaux, Boulogne, Calais, Dieppe, Rouen.
OVERSEA POSSESSIONS: Corsica, Algeria, Tunis, Senegal, etc. Madagascar, Guiana, Martinique, S. Pierre, New Caledonia, Pondicherry, Annam, Cochin China, Tonquin.

Flags.



Note.—A vice-admiral wears his flag at the fore, rear-admiral at the main.

Uniform.

INSIGNIA OF RANK ON SLEEVES—EXECUTIVE OFFICERS.

Vice-Amiral.	Contre-Amiral.	Capitaine de vaisseau.	Capitaine de fregate.	Lieutenant de vaisseau.	Enseigne.	Enseigne 2 classe and Aspirant
„	Rear-Ad.	Captain.	Commander.	Lieut. (senior).	Lieut. (junior).	Sub-Lieut. and Midshipman. (U.S. Ensign.)

Corresponding British or U.S. Navies.

Only one of the capitaine de fregate's upper stripes is gold: the other is white.

Epaulettes with parade uniform are of the usual sort, *except* that—

A Vice-Admiral's epaulettes have the usual anchor and 3 stars.

A Rear-Admiral's „ „ „ „ 2 „

Caps are the usual shape, but have gold bands round. The cocked hat carries the tri-colour.

Naval Bases.

(Dockyards in heavier type).

In the Channel and Atlantic.

DUNKIRK. Fine harbour. Breakwater. Torpedo base. There are five docks here—one 600×80×28, one 393×46×25¾, and three lesser size.

CALAIS. Torpedo and submarine base. Dock, 426¼×69×28½.

CHERBOURG. Protected by a breakwater about two miles long. Heavily fortified.

Dry Docks.

No. 1	360	× 94	× 29½	feet.	No. 5	499 × 118	× 36½ feet.
„ 2	393	× 94	× 29½	„	„ 6	513 × 108	× 26 „
„ 3	390	× 94	× 29½	„	„ 7	265 × 81	× 17½ „
„ 4	360	× 94	× 29½	„	„ 8	257 × 79	× 17½ „

BREST. There is only one dock able to take big modern warships. There are eight smaller docks unable to take any modern warship of importance. Forts, very numerous and powerful. Very big dock in town, 737×114×34. Particulars of naval docks here:

Nos. 1 & 3	574 × 70 × 35½	No. 7	410 × 87 × 35½ } Can be used
„ 2 & 4	518 × 92 × 35½	„ 8	354 × 66 × 35½ } as one dock.
No. 5	377 × 66 × 35½	„ 9	387 × 66 × 35½
„ 6	223 × 48 × 16		

LORIENT. One dry dock 513×85¾×27¾ feet; one 380×55×22 feet; *one very large building.*

ROCHEFORT. The three docks here cannot accommodate modern big ships. The largest is 489×67½×25¼. The majority of submarines are built here.

There is a Government dock at La Pallice (Rochelle), 553×72×30 feet.

In the Mediterranean.

TOULON. No. 4 Dock *not yet completed.* Very strongly fortified

Dry Docks.

MISSIESSY.	No. 1	427	× 92	× 32½	CASTIGNEAU.	No. 1	325 × 71 × 25½
„	„ 2	427	× 92	× 32½	„	„ 2	385 × 72½ × 27½
„	„ 3	492	× 92	× 32½	„	„ 3	535 × 72¼ × 27½
„	(*New*) „ 4	600	× 92	× 32½			

„ Floating dock for torpedo craft.

Also 3 small docks in the Arsenal principal.

Big Private Docks.

HAVRE. (New dock) 625×98×28½ feet.
BREST. (Town) 737×114×34 feet.

ST. NAZAIRE. (C.G.T.) 731½×98½×29 feet (enlarged).
MARSEILLES. (No. 1) 566×61×22¼ feet.

(Continued on next page).

FRENCH NAVAL BASES.

Naval Bases.—*(Continued).*

AJACCIO. BONIFACIO. } Fortified harbours used by the French fleet. No docks.

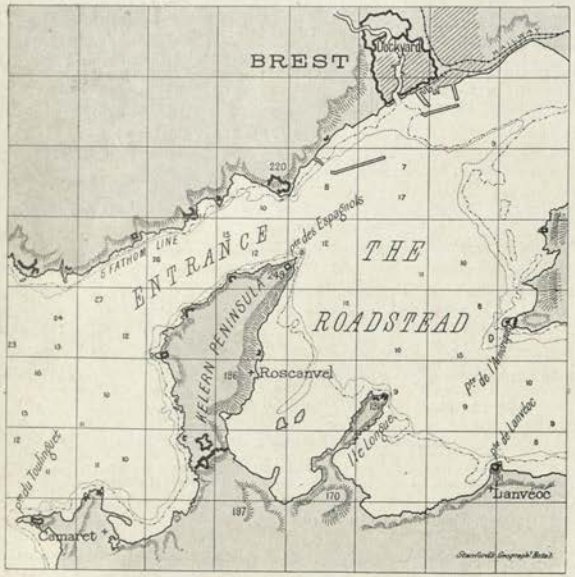
ALGIERS. Coaling Station. Two dry docks (No. 1) 455×86½×28 feet; (No. 2) 268×73×19 feet. Average depth of harbour, 8 fathoms.

ORAN. Torpedo base. Excellent harbour, with an average depth of five fathoms. Two breakwaters. Fortified. New works in progress.

BIZERTA. New naval base still completing. Lies inside a narrow channel. One large dock suitable for any warship, one small one. Floating dock for torpedo craft. (No. 1) 656×90½×33½; (No. 3) 295×46½×17¼; (No. 4) 656×90½×33½.

In the Far East,

SAIGON. Situated 42 miles up the Donnoi River. Anchorage average, 9 fathoms. One large dry dock 518×72×30 feet, and two small ones. Torpedo craft built in the small dockyard here.



BREST. Admiralty Chart No. 3427. Rise of Spring Tide, 19½ feet.

CHERBOURG. Admiralty Chart No. 2602. Rise of Spring Tide, 17¾ feet.

ORAN. Admiralty Chart No. 812.

BIZERTA.—Admiralty Chart No. 1563.

TOULON. Admiralty Chart No. 151-2608

AJACCIO. Admiralty Chart No. 429.

Guns (Schneider-Canet type).

Notation.	Calibre.		Length.	Model.	Weight of gun.	Weight of A.P. shot.	Initial velocity.	Penetration against K.C.			*Approximate* Danger Space for *average ship* at		
	m/m.	inches.	cals.		tons.	lbs.	f. s.	9000 in.	6000 in.	3000 in.	10,000 yards.	5000 yards.	3000 yards.
A^8	*340*	13·4	...	1911	67	1433	2657	12	16	20	...	...	...
A^6	*305*	12	50	1906	57	1000	3005	11	14	18	200	640	
A^5	*305*	12	50	1902	50	731	3000	8	13	17	160	610	
A^4	*305*	12	45	1896	46½	644	2870	7	12	15	150	570	1080
AA	*305*	12	40 & 45	'93, '91, '87	46⅓	644	2700	4½	9	12	150	510	1050
AAA	*274*	10·8	45	1896	35½	476	2870	5	10	13½	150	540	1020
AA	*274*	10·8	45 & 40	1893	35	476	2625	3	7	11¼			
B	*274*	10·8	45 & 40	'87 & '84	35	476	1969	...	5	9			
A^2	*240*	9·4	50	1906	24	375	2969	4	9	14			
A	*240*	9·4	40	1893	22¾	317½	2625	3	6	9	144	540	1080
A	*194*	7·6	45	1902	15	185	3117	...	6	9	144	...	...
B	*194*	7·6	40	1896	12½	185	2870	...	5	8¼	120	525	1080
C	*194*	7·6	40 & 45	'93 & '91	10½	165	2625	...	3½	6	96	435	1020
C	*164*	6·4	45	1902	9¼	114½	3002		4¼	7		330	750
D	*164*	6·4	45	1896	9	114½	2870		4	6		285	630
E	*164*	6·4	45	1891	7	99¼	2625		...	4½	...	240	585
F	*164*	6·4	45	1887	6½	99¼	2297		...	3	...	150	360
F	*138*	5·5	45	'93-'87	6½	81½ / 77	2395		...	3	...	120	300
F	*100*	4	55	'92 & '93	2¼	31	2494		...	2¾	...	...	...
F	*100*	4	45	1891	1½	31	2428		...	2	...	...	...
F	*100*	4	50	1889	2	31	2494		...	2	...	...	...
F	*75*	3	65	1908		14							

NOTES ON GUNS.

Powder.—1902 and later models fire a species of M.D. cordite; 1896 and earlier models, a nitro-cellulose.

Projectiles.—Capped A.P. for all calibres. Melinite shell for all guns. Shell of the 1912 13·4 is 1190 lbs. Reported to be charged with thermite. Shell of the 50 cal. 12 inch, 970 lbs. The A.P.S. has a 28¾ lb. burster. The ordinary shell has a 55 lb. burster.

Funnel Marking System, etc.

Big ships:—1st squadron, 1 white band; 2nd squadron, 2 white bands. Ships in division distinguished by funnel on which bands are painted: *i.e.* flagship on foremast funnel, 2nd on 2nd, etc. Ships different to others, no marks.

Destroyers:—Coloured bands. 1st flotilla *blue*, 2nd *white*, 3rd *red*, 4th *green*, 5th *black*. Also initials of names on bows, and flotilla colour on name scroll on stern.

Torpedoes.

Whitehead pattern. Made at Fiume and at Toulon Torpedo Factory; also Schneider pattern at Schneider & Cie's works.

French Designation.	Diameter.	Length.	Charge.	Pressure in chamber.	*Maximum* range.
	inches.	feet.	lbs.	lbs. per sq. in.	
1904 model	18	19½	198	2150	6000
45 c/m *long*	18	16½	198	1270	2000
45 c/m *short*	18	13½	185	1000	1500
38 c/m *long*	15	18¾	100		1000
38 c/m *short*	15	16½	85		1000
356 m/m *long*	14	16½	79		600
356 m/m *short*	14	15	60		600

Notes.—All fitted with gyros.

The 1904 model is fitted to all battleships from and after *Patrie*, all cruisers from and after *Jules Ferry*, all t.b.d. of and after 1904 date, and all submarines after Q 47.

Submerged tubes mostly bear 20°-45° *before* the beam. Pattern very similar to the British—same sort of bar.

General Notes.

Colour of Ships.

Big ships.—Grey.

Destroyers, etc.—Light grey.

Submarines.—Sea green.

Personnel.

About 53,000 all ranks and 120,000 reserve.

Guns.

13·4 inch, M. '11, in *Bretagne* and later ships.

12 inch, M. '06, in *Danton* class (6), *J. Bart* class (4).
M. '02, 50 cal., in *Verité* class (3).
M. '96, 45 cal. in *Republique, Patrie, Suffren.*
M. '93, 40 cal., in *Charlemagne* class (3), *Bouvet, Massena.*
M. '91, 45 cal., in *Carnot, Jaureguiberry.*
M. '87, 45 cal., in *C. Martel.*

M. '96, 10·8, 45 cal., in *Henry IV.*
M. '93, 10·8, in *Massena, Bouvet.*
M. '87 and '84, 10·8, in *Carnot, C. Martel.*

M. '06, 9·4, 50 cal., in *Danton* class (6).
M. '93, 9·4, 40 cal., in *D'Entrecasteaux.*

FRENCH PRIVATE YARDS.

Principal Private Yards (arranged alphabetically), *which build warships.*

CHANTIERS DE BRETAGNE (formerly De la Brosse & Fouché), NANTES. Destroyers, t. b., etc.

CHANTIERS DE LA GIRONDE, BORDEAUX. All kinds of warships. Water front: 623 yards. Area of works: about 48 acres. Four slips: (1) 597 feet, (2) 515 feet, (3) 436 feet, (4) 590½ feet. Titan cranes to first two. One dock, which can be used for building: 594×121½×32½ feet, with 140 ton electric crane. Special submarine workshop: 141×49 feet.

CHANTIERS DE LA LOIRE. Works at ST. NAZAIRE (all kinds of warships) and NANTES. Machinery works at SAINT DENIS.

CHANTIERS DE ST. NAZAIRE (Penhoet). Principal yard ST. NAZAIRE. Works also at ROUEN. All kinds of warships.

DYLE & BACALAN, BORDEAUX. Destroyers, t.b., etc. Five slips, longest of which is 394 feet. Served with two 40 ton cranes. Machinery: 7000 h.p.

FORGES ET CHANTIERS DE LA MEDITERRANÉE. Principal yard LA SEYNE, near TOULON. Other yards at HAVRE, GRANVILLE and MARSEILLES. All kinds of warships built at La Seyne, smaller craft at other yards. Total employes circa 6500.

NORMAND & Cie. Destroyer and torpedo boat works at HAVRE. Build ships up to 4000 tons. Yard covers 4 hectares. Large water front. Employees: 1000 to 1200. Boiler works, etc.

SCHNEIDER & Cie. (formerly Schneider-Canet). In addition to the gun and torpedo factory this firm builds machinery for warships and also constructs torpedo craft and submarines at LE CREUSOT. Total employés 18,200.

FRENCH WARSHIPS (one funnel), IDENTIFICATION AND SIGNAL SILHOUETTES.

F cone.

BA TRÉHOUART (*page* 292).

CN DROME.

DN Modern Screw Gunboats.

DO MANCHE *class* (Avisos Transports).

FRENCH BATTLESHIPS (two funnels), IDENTIFICATION AND SIGNAL SILHOUETTES (*copyright*).

GH SUFFREN (*page* 261).

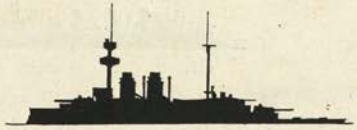
GI CHARLEMAGNE *class* (*page* 262) (3 ships).
(Distinguished from Suffren by funnels).

GJ BOUVET (*page* 263).

GL CARNOT (*page* 264).

HG CHARLES MARTEL (*page* 264).

HJ JAUREGUIBERRY (*page* 264).



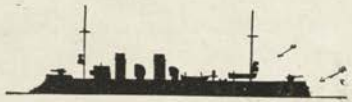
HK HENRI IV. (*page* 262).

HL BOUVINES (*page* 284).

IK FURIEUX (*page* 284).

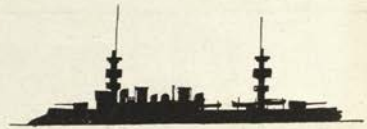
JG MASSENA (*page* 263).

KN Descartes (*page* 274).



KR Lavoisier (*page* 274).

KS D'Estrees (*page* 272).



KT Bruix *class* (*page* 274) (2 ships).

KU D'Iberville.

KV Cassini *class* (2 ships).

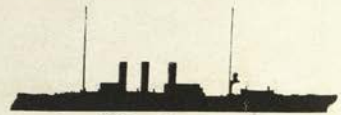
KW Dunois *class* (2 ships).

LN Kersaint.

All *page* 275 *or* 276.

NG Verité & Republique *classes* (*pages* 260 & 259) (6 ships).

OG Du Chayla *type* (*page* 274).



PG Foudre.

QG D'Estrecasteaux (*page* 273).

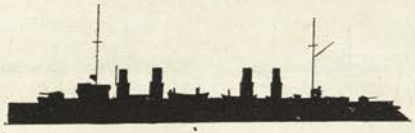
RG Pothuau (*page* 271).

N Courbet (*page* 257).

FRENCH WARSHIPS (four to six Funnels), IDENTIFICATION AND SIGNAL SILHOUETTES).

FOUR FUNNELS.

UG Chateaurenault.



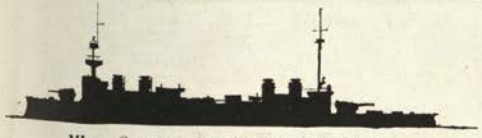
VG Guichen (*page* 273).

VH Desaix *class* (*page* 270) (3 ships).

VI Michelet (*page* 266).

VJ Jurien de la Graviere (*page* 272).

VK Aube and Montcalm *classes* (*pages* 269 and 270) (7 ships)
(Impossible to differentiate these classes except quite close).



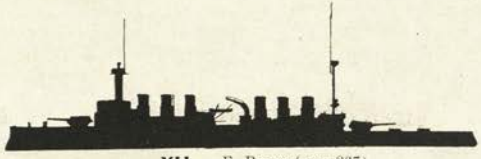
VL Gambetta *class* (*page* 268) (3 ships).

FIVE FUNNELS.

X Danton *class* (*page* 258) (6 ships).

SIX FUNNELS.

YG Waldeck Rousseau *class* (*page* 265) (2 ships).



YH E. Renan (*page* 267).

YI Jeanne D'Arc (*page* 271).

B 1 funnel t.b.

C Old sea going t.b.

G Latest 2 funnel t.b. **H** Earlier 2 funnel t.b.

I Early 2 funnel destroyers.

J Takou.

O Janissaire t.b.d.

P Lansquenet t.b.d.

X Old 4 funnel destroyers.

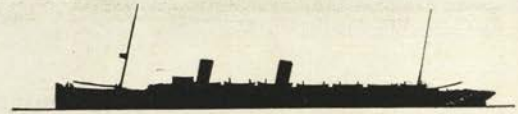
Y Spahi & Fantassin *class* t.b.d.

Z Bouclier *class* t.b.d.

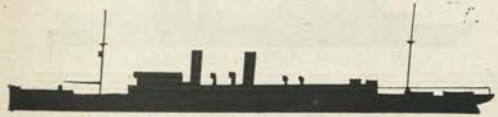
FRENCH LINERS of 18 knots or over.

FM cone.

G La Lorraine (*C.G.T.*) (1900), 11,400 tons, 21 kts. La Savoie (1900), 11,100 tons (21·5 kts.) La Provence (1905), 14,000 tons (22 kts.)



H La Touraine (*C.G.T.*) (1890), 8300 tons. (19·5 kts.)



J Espagne (*C.G.T.*) (1909), 11,100 tons (20 kts.)

N Burdigala (*C. de Nav. Sud. Atl.*) (1897), 12,500 tons (18 kts.)

O Gallia, Lutetia, Massilia (1913), (*C. de Nav. Sud. Atl.*) 14,500 tons. (20 kts.

P Patria (1914), (*Cyprien Farbe & Cie*) (18 kts.)

S La France (*C.G.T.*) (1910), 22,700 tons (23·5 kts.)

1913 FRENCH DREADNOUGHTS. Nos. 12, 11, 10, 9, 8

(Normandie Class.)

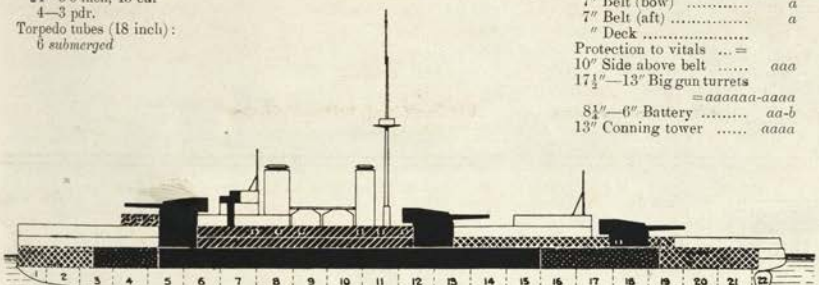
NORMANDIE (1914), *GASCOGNE* (1914), *LANGUEDOC* (1914), *FLANDRES* (1914), & *BEARN* (*bldg.*)

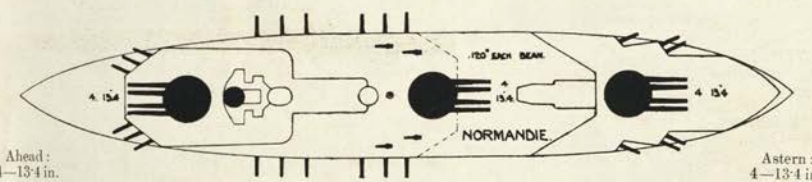
Displacement, 25,387 tons. Complement, .

Length (*waterline*), 574 feet. Beam, 92 feet. *Maximum* draught, 28¼ feet.

Guns (Mod. '11):
12—13·4 inch, 45 cal.
24—5·5 inch, 45 cal
4—3 pdr.
Torpedo tubes (18 inch):
6 *submerged*

Armour:
12¾″ Belt (amidships) ... *aaaa*
7″ Belt (bow) ..... *a*
7″ Belt (aft) ..... *a*
″ Deck .....
Protection to vitals ...=
10″ Side above belt ..... *aaa*
17½″—13″ Big gun turrets =*aaaaaa-aaaa*
8¼″—6″ Battery ..... *aa-b*
13″ Conning tower ..... *aaaa*





Ahead: 4—13·4 in.

Astern: 4—13·4 in.

Broadside: 12—13·4 inch.

Machinery: Turbine and reciprocating combined. 4-shaft. Boilers: see *Notes*. Designed H.P. 32,000 =21 kts. Coal: *normal*, 900 tons; *maximum*, 2700 tons. Oil: tons.

Gunnery Notes.—The forward turret guns are 36 feet above l.w.l., amidship guns 32½ feet, after guns 26½ feet. Arcs of fire: centre turret, 120 on either beam; other turrets, 280. The turrets are 32 feet wide, and weigh 1300 tons each. Ammunition carried: 1200 for big guns; 6600 for the 5·5 inch. Special cooling to magazines.

Torpedo Notes.—30 mines carried. Bullivant net defence.

Armour Notes.—Main belt is 13 feet deep, 8 feet of it above and 5 feet below l.w.l. Upper belt: 361 feet long, 7 feet deep. There are three protective decks. Battery, 197 feet long.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Boilers*	*Best max. speed*
Normandie	S. Nazaire (Lre)	S. N. (Loire)	May, '13	'16		Parsons	Belleville	
Gascogne	Lorient	Indret	May, '13	'16		Parsons	Guyot D.T.	
Languedoc	Gironde	Gironde	April,'13	'17		S. Zoelly	Belleville	
Flandres	Brest	...	May, '13	'17		Parsons	Guyot D.T.	
Bearn	La Seyne	La Seyne	'14	'18		Parsons	Niclausse	

General Notes.—Designed by Chief Constructor Doyère. Fitted with anti-rolling tanks and very wide bilge keels. Special coaling gear fitted to take 300-450 tons an hour. Freeboard forward, 25 feet; aft, 16½ feet.

Building.

New Programme.

Duquesne class, 4 ships. 29,500 tons. 16—13·4 inch. 4 quadruple turrets. 4 to 6 Scout-Cruisers *about* 4500 tons. 4 destroyers, 1200 tons, armed with 3—5·5 low velocity guns.

1912 FRENCH DREADNOUGHTS. Nos. 7, 6, 5

(Bretagne Class—3 Ships).

BRETAGNE (April, 1913), *LORRAINE* (September, 1913), *PROVENCE* (April. 1913).

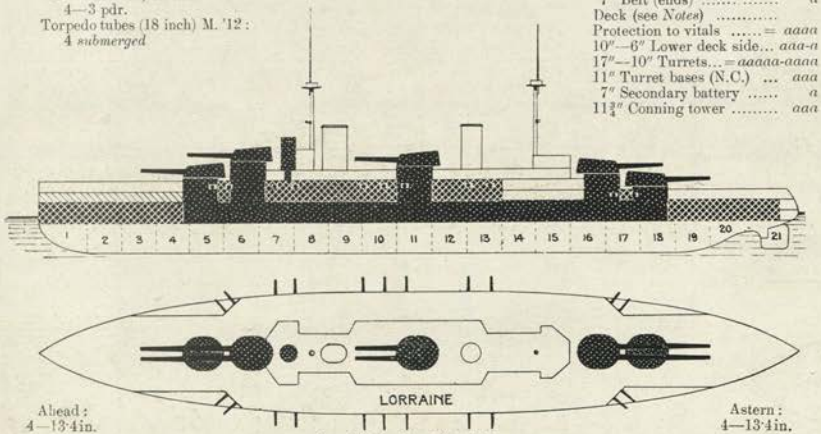
Displacement, 23,550 tons. Complement, 1109.

Length (*waterline*), 541 feet. Beam, 88½ feet. *Maximum* draught, 28 feet 7 in. Length *over all*, feet.

Guns:
10—13·4 inch, 45 cal. (*A*[7])
22—5·5 inch, 45 cal.
4—3 pdr.

Torpedo tubes (18 inch) M. '12:
4 *submerged*

Armour:
10¾″ Belt (amidships) ..... *aaa*
7″ Belt (ends) ..... *a*
Deck (see *Notes*) .....
Protection to vitals .....= *aaaa*
10″—6″ Lower deck side... *aaa-a*
17″—10″ Turrets...=*aaaaa-aaaa*
11″ Turret bases (N.C.) ... *aaa*
7″ Secondary battery ..... *a*
11¾″ Conning tower ..... *aaa*



Ahead:
4—13·4in.

Astern:
4—13·4in.

Broadside: 10—13·4 inch.

Machinery: Parsons turbine. 4 screws. Boilers: see *Notes*. Designed H.P. 29,250=20·5 kts.

Coal: *normal* 900 tons; *maximum* 2700 tons. Also 300 tons oil.

Gunnery Notes.—Carry 100 rounds per gun for 13·4 inch and 275 per gun for the 5·5 inch. Janney electro-hydraulic mountings to big guns. Special cooling for magazines—temperature 77° Fahr. Magazines can be completely flooded inside ten minutes. Height of guns above l.w.l.: 1st turret, 30½ feet; 2nd, 35½ feet; 3rd, 35½ feet; 4th, 28½ feet; 5th, 21½ feet. Arcs of training: Nos. 1 & 5, 270°; Nos. 2 & 4, 280°; No. 3, 120° either beam. Arcs of secondary guns: 120°.

Torpedo Notes.—Bullivant net defence. 8—36″ and 2—30″ searchlights. 4—200 k.w. dynamos. Torpedoes: 1912 Schneider, 6000 yards range. 24 carried. Also blockade-mines.

Armour Notes.—Turrets of maximum thickness at ports, instead of uniform thickness as in *J. Barts*. The double bottom is carried to the under side of protective deck. Main belt is 13½ feet wide, 5$\frac{7}{12}$ feet below and 7½ above l.w.l. Battery 197 feet long with 7 in. bulkheads. Protective decks: lower 2″ slopes, 1½″ flat. Upper, 1½″ flat on top of belt.

Engineering Notes.—Boilers: *Bretagne*, 24 Niclausse; *Lorraine*, 24 Belleville; *Provence*, 18 Guyot de Temple. Grate area: *Bretagne*, 2,090 sq. feet; *Lorraine*, 2,030 sq. feet; *Provence*, 1,492 sq. feet. Heating surface: *Bretagne*, 64,660 sq. feet; *Lorraine*, 63,700 sq. feet; *Provence*, 62,585 sq. feet. Pressure, 256 lbs. per sq. in. 300 turbine r.p.m. 2,500 tons coal in 13 bunkers, 300 tons oil in 4 tanks. Radii: 8,500 miles at 10 kts. 2,500 at 20 kts.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Boilers*	*Best recent speed*
Bretagne	Brest	La Seyne	July '12	'14-'15		Parsons	Niclausse	
Lorraine	S.Nazaire (Pen.)	S.Nazaire (Pen.)	July '12			Parsons	Belleville	
Provence	Lorient	La Seyne	July '12			Parsons	D.T.Guyot	

General Notes.—*B., L.* and *P.* belong to the 1911 programme, one of them being a replace ship for the *Liberté*, blown up September, 1911. All fitted with a special hydraulic anti-rolling device. Estimated cost, £2,908,000 per ship=£126 per ton. Bilge keels: 213×2½ feet. Bulkheads are longitudinal and transverse; latter solid amidships.

Building.

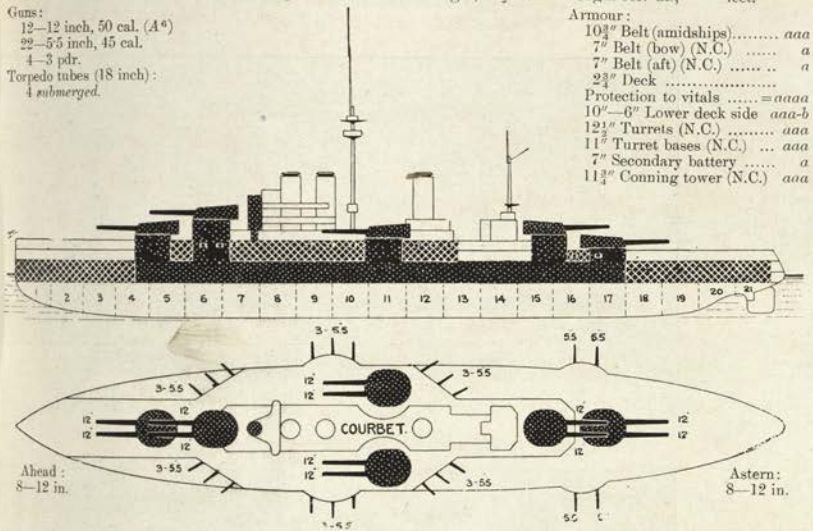
COURBET (Sept., 1911), & **JEAN BART** (Sept., 1911), **PARIS** (Sept., 1912), **FRANCE** (Nov., 1912).

Displacement, 23,467 tons. Complement, 904.

Length (*p.p.*), 541½ feet. Beam, 88½ feet. *Maximum* draught, 29½ feet. Length *over all*, feet.

Guns:
12—12 inch, 50 cal. (*A*[6])
22—5·5 inch, 45 cal.
4—3 pdr.
Torpedo tubes (18 inch):
4 *submerged*.

Armour:
10¾″ Belt (amidships)..... *aaa*
7″ Belt (bow) (N.C.) ..... *a*
7″ Belt (aft) (N.C.) ..... *a*
2¾″ Deck .....
Protection to vitals .....=*aaaa*
10″—6″ Lower deck side *aaa-b*
12½″ Turrets (N.C.) ..... *aaa*
11″ Turret bases (N.C.) ... *aaa*
7″ Secondary battery ..... *a*
11¾″ Conning tower (N.C.) *aaa*



Broadside: 10—12 in.

Machinery: Parsons turbine. 4 screws. Boilers: 24 Belleville or Niclausse. Designed H.P. 28,000=21 kts. Coal: *normal* 900 tons; *maximum* 2700 tons.; also 1000 tons oil. *Nominal radius* 8400 at 10 kts., 2300 at 20 kts.

Armour Notes.—Belt 13½ feet wide; 7¾ feet of it above water, 5½ feet of it below. For about 325 feet it is 10¾″. Upper belt 7″ thick forms redoubt for secondary battery. The 4—5·5 inch aft. are in casemates. Prot. decks: 2¾″ curved from lower edge of belt to l.w.l. level. Above that a flat 1¾″ deck from end to end on top of main belt. Above again is a 1¼″ splinter deck against aerial attack. Conning tower is in three stories. 10¾″ communication tube. Two armoured fire control stations on top.

Gunnery Notes.—Amidship 12 inch 180°, the centre line turrets 270° each. The 5·5 inch 120°.

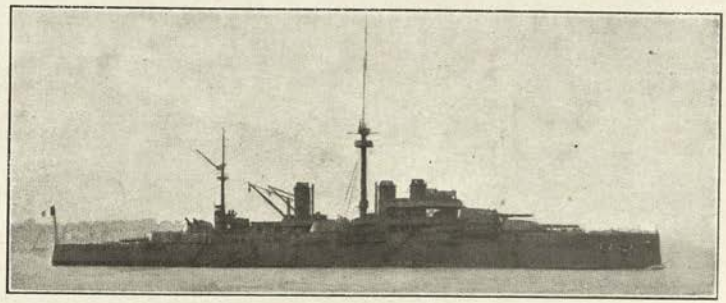
Height of guns above water: Turrets (1) 30½ feet. (2) 37¾ (amidships) 25 feet, (5) 28½ feet, (6) 21½ feet; upper deck battery, 5·5 inch, 19 feet; main deck, 5·5 inch aft, 11⅜ feet. Ammunition carried: 100 for each 12 in., 275 each 5·5, 300 each 3 pdr. Westinghouse refrigerators in magazines. 77°F.

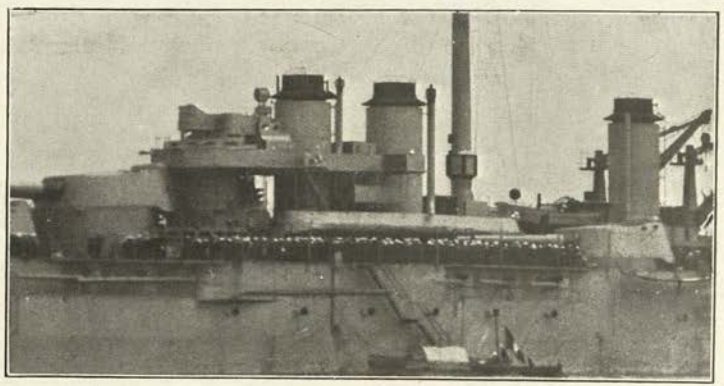
Torpedo Notes.—8 searchlights (36 inch), also 2—30 inch. Carries 12 torpedoes and 30 blockade mines.

Engineering Notes.—Pressure: 256 lbs. Outer shafts: H.P. turbines; inner, L.P. Condensers (2): 32,076 sq. feet cooling surface. Turbines: 300 r.p.m. Belleville oil fuel system.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
J. Bart	Brest		Nov., '10	1913	=22·04	Belleville	22·6
Courbet	Lorient		Sept., '10	1913	=20·74	Niclausse	
Paris	La Seyne		Nov., '11	1914	...	Niclausse	
France	St. Nazaire		Nov., '11	1914	...	Belleville	

General Notes—Designed by M. Lyasse.





1907 FRENCH BATTLESHIPS ("SEMI-DREADNOUGHTS") (*Cuirassés d'Escadre*) (19 knot).

(Danton Class—6 Ships).

DANTON, MIRABEAU, DIDEROT, CONDORCET, VERGNIAUD & VOLTAIRE (Jan., 1909).

Normal displacement, 18,400 tons. Complement, 681 (as flagship 753).

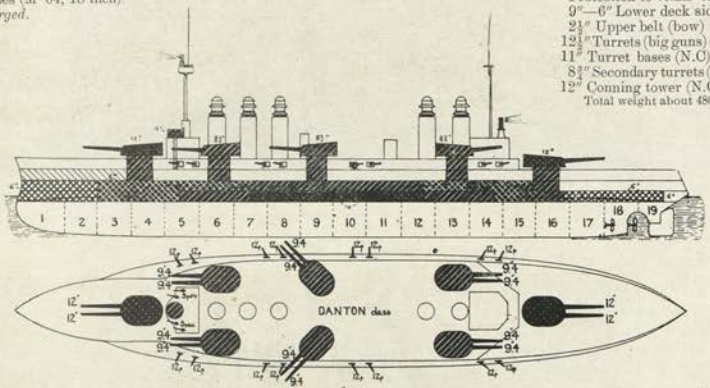
Length (*waterline*), 475¾ feet. Beam, 84¼ feet. *Maximum* draught, 27½ feet. Length *over all*, 480 feet.

Guns (M '06)
- 4—12 inch, 50 cal. (*AAAAAA*).
- 12—9·4 inch, 50 cal. (*AAA*).
- 16—12 pdr., S.A.
- 10—3 pdr., S.A.

Torpedo tubes (M '04, 18 inch).
- 2 *submerged*.

Armour:
- 10″ Belt (amidships) ..... *aaa*
- 6″ Belt (ends) ..... *b*
- 3″ Deck (flat on upper belt) ...
- 3″ Deck (below belt) .....
- Protection to vitals ..... = *aaaa*
- 9″—6″ Lower deck side..... *aa-b*
- 2⅜″ Upper belt (bow) ..... *c*
- 12⅜″ Turrets (big guns) (N.C) *aaa*
- 11″ Turret bases (N.C) ..... *aa*
- 8¼″ Secondary turrets (6) (N.C) *aa*
- 12″ Conning tower (N.C) ... *aaa*

Total weight about 4800 tons.



Ahead: 2—12 in. 4—9·4 in.

Astern: 2—12 in. 4—9·4 in.

Broadside: 4—12 in., 6—9·4 inch.

Machinery: Parsons turbine. 4 screws. Boilers: Belleville and Niclausse. Designed H.P. 22,500 = 19·4 kts. Coal: *normal* 925 tons: *maximum* 2100 tons. *Nominal radius* 13,800 at 10 kts., 2000 at full power.

Armour Notes.—Main belt is about 6½ feet wide, about 2½ feet of it below waterline. Lower edge is 3″ thick. There is a deck on top of the main belt as well as below it, also lateral armoured bulkheads extend from the lower armoured deck to the bilge keels.

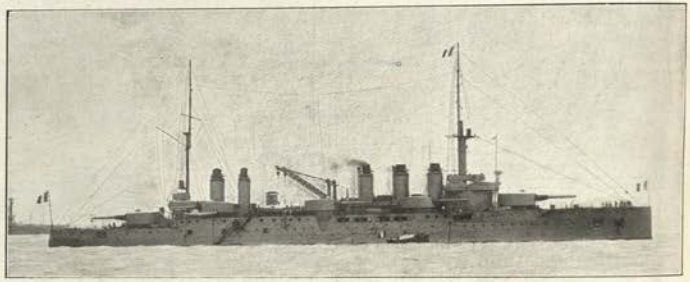
Gunnery Notes.—Arcs of fire: Big guns, 260°. Secondary guns about 140° or more. Rounds carried: 12 in., 74 per gun; 9·4 in., 100 per gun; 12 pdrs., 500 per gun.

Engineering Notes.—Bellevilles of these ships have 332 elements and 8852 tubes. Niclausse 339 elements and 8814 tubes.

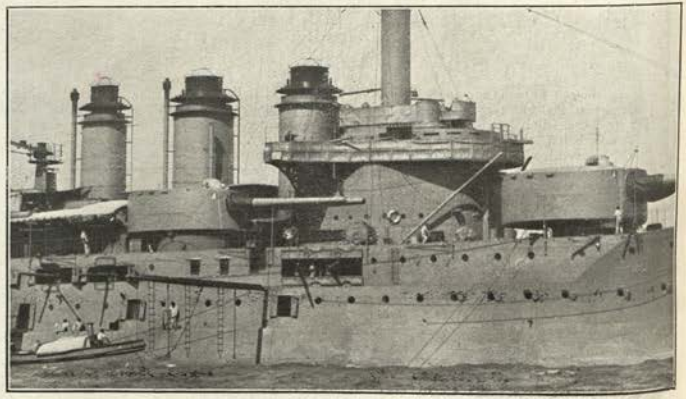
General Notes.—These ships belong to the 1906-7 programme. Designer, M. L'Homme.

Name.	*Builder*	*Machinery.*	*Laid down*	*Completed.*	*Trials. 24 hrs.*	*10 hrs.*	*3 hrs.*	*Boilers*	*Best recent speed.*
Danton	Brest Yard	F. & Ch., Medit.	Feb.,'08	Mar.,'11	= 18·16	= 19·44	= 20·18	Belleville	20·66
Mirabeau	Lorient Yard	St. Nazaire	May,'08	July'11	= 18·27	= 19·73	= 20·18	Belleville	
Diderot	St. Nazaire	St. Nazaire	1907	June'11	= 18·4	= 19·48	= 19·9	Niclausse	
Condorcet	St. Nazaire	St. Nazaire	1907	June'11	= 18·02	= 19·31	= 19·7	Niclausse	
Vergniaud	Bordeaux	F. & Ch., Medit.	July,'08	Sept.,'11	= 17·74	= 19·20	= 19·63	Niclausse	19·25
Voltaire	La Seyne	F. & Ch., Medit.	June,'07	June'11	= 18·60	= 19·78	= 20·66	Belleville	

Average cost, £2,190,000 each.



Danton.



1903 FRENCH BATTLESHIPS (18 knot).

(VERITÉ CLASS—3 SHIPS).

DÉMOCRATIE (April, 1904), **JUSTICE** (September, 1904), **VERITÉ** (May, 1907).

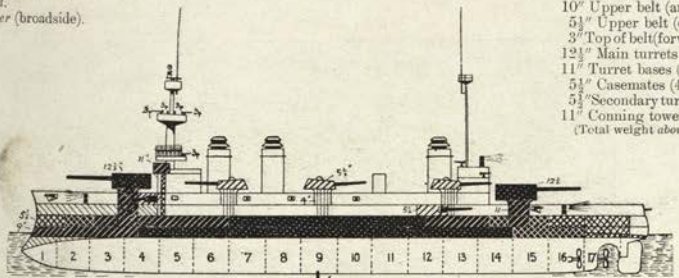
Normal displacement, 14,900 tons. Complement, 793.

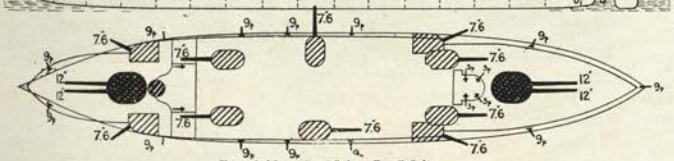
Length (*waterline*), 439 feet. Beam, 79½ feet. *Maximum* draught, 28 feet. Length *over all*, 452 feet.

Guns—(M. '02):
4—12 inch, 50 cal. (*AAAAA*).
10—7·6 inch, 45 cal. (*A*).
13—9 pdr.
10—3 pdr.

Torpedo tubes (1904 pattern):
2 *submerged*.
2 *above water* (broadside).

Armour:
11″ Belt (amidships) ..... *aaa*
9″ Belt (forward) ..... *aa*
7″ Belt (aft) .....
2¾″ Deck .....
Protection to vitals .....=*aaaa*
10″ Upper belt (amidships) *aaa*
5½″ Upper belt (ends) ... *b*
3″ Top of belt (forward) (N.C.) *c*
12½″ Main turrets (N.C.)... *aaa*
11″ Turret bases (N.C.) ... *aa*
5½″ Casemates (4) (N.C.) *c*
5½″ Secondary turrets (6) (N.C.) *c*
11″ Conning tower (N.C.) *aa*
(Total weight *about* 4100 tons).

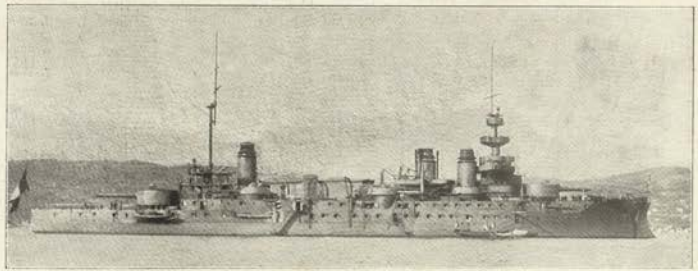




Ahead:
2—12 in.
4—7·6 in.

Astern:
2—12 in.
4—7·6 in.

Broadside: 4—12 in., 5—7·6 in.



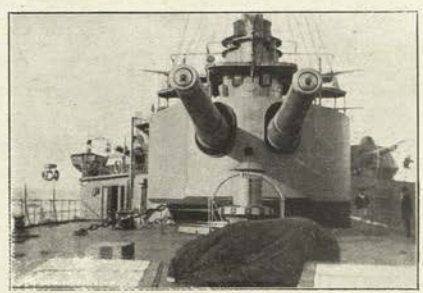
Machinery: 3 sets vertical inverted triple expansion, four cylinder. 3 screws. Boilers: 22 Belleville or 24 Niclausse. Designed H.P. 18,000=18 kts. Coal: *normal* 905 tons; *maximum* 1825 tons. *Nominal* radius 8400 at 10 kts.

Armour Notes.—Main belt is about 6½ feet wide, 2½ ft. is above waterline. Lower edge is 3¼″ thick. Upper belt is generally about 10% thinner at top than at bottom. Backs of casemates 4″.

Gunnery Notes.—Loading positions, big guns: all round. Balanced turrets. Hoists, electrical for all guns. All guns manœuvred electrically. Big guns fire three rounds in two minutes. Axial fire of amidship turrets doubtful.
Arcs of fire: Big guns 260°; Secondary turrets 180°; Casemates 130° from axial line.
Height of guns above water: Bow turret, 30 feet; after turret, 22½ feet; secondary turret, 29 feet.

Torpedo Notes.—Submerged and above water broadside tubes all about base of fore turret. 1904 pattern torpedoes.

Name.	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials.*		*Boilers.*	*Best recent speed*
Justice	La Seyne	F. & Ch., Medit.	1903	'07	11,530=17·94	18,548=19·43	Niclausse	17·75
Democratie	Brest	F. & Ch., Medit.	1903	July,'07	11,472=17·35	19,190=19·49	Belleville	
Verité	Bordeaux	Indret	1903	Mar.,'08		20,433=19·26	Belleville	



Big guns: VERITÉ *class.* *Photo, Guido F. Forster, Esq.*

General Notes.—Estimated cost, about £1,425,000 per ship. A fourth sister *Liberté* blown up 25th September, 1911. The ships of this and the *Patrie* class are the most economical steamers in the French Navy, and all steam well. An average of 17·4 for three days has been maintained.

(Republique Class—2 Ships).

REPUBLIQUE (Sept., 1902), & **PATRIE** (Dec., 1903).

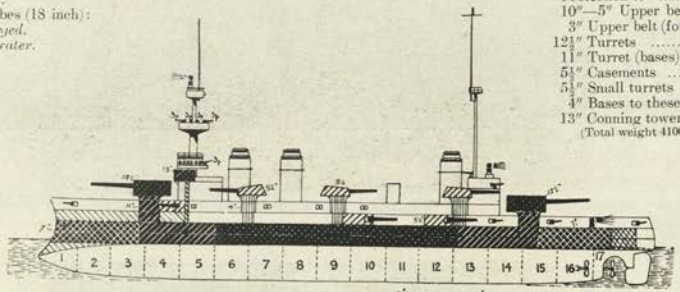
Displacement, 14,865 tons. Complement, 793.

Length (*waterline*), 439 feet; Beam, 79½ feet; *Maximum* draught, 27½ feet; Length *over all*, 452 feet.

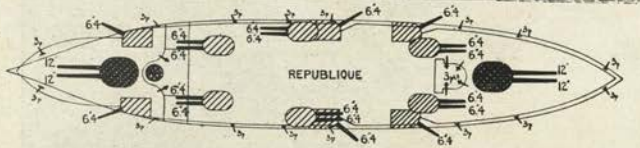
Guns—(M. 1896):
4—12 inch, 45 cal. (*AAAA*).
18—6·4 inch, 45 cal.
25—3 pdr.
2—1 pdr.

Torpedo tubes (18 inch):
2 *submerged*.
3 *above water*.

Armour:
11″ Belt (amidships)... *aaa*
7″ Belt (ends) ..... *a*
3″ Deck (flat below belt)
Protection to vitals ...*aaaaa*
10″—5″ Upper belt ... *aaa-b*
3″ Upper belt (forward) *c*
12½″ Turrets ..... *aaa*
11″ Turret (bases)..... *aa*
5½″ Casements ..... *c*
5½″ Small turrets ..... *c*
4″ Bases to these ... *d*
13″ Conning tower ... *aaa*
(Total weight 4100 tons).

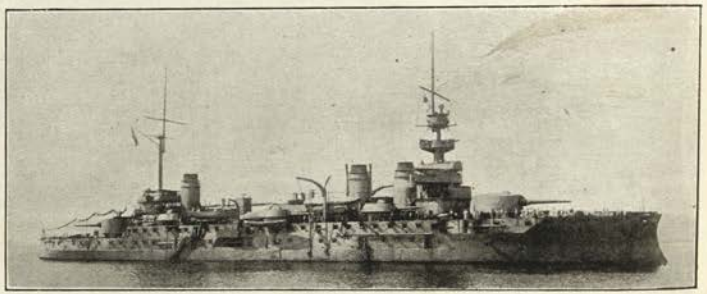


Ahead:
2—12 in.
6—6·4 in.



Astern:
2—12 in.
6—6·4 in.

Broadside: 4—12 in., 9—6·4 in.



Patrie. *Photo, Geiser.*

Machinery: 3 sets vertical inverted triple expansion. 3 screws. Boilers: 24 Niclausse. Designed H.P 17,500=18 kts. Coal: *normal* 900 tons; *maximum* 1850 tons. *Nominal* radius: 8400 at 10 kts.

Armour Notes.—As for *Vérité*; but the thicknesses fore and aft are differently disposed.

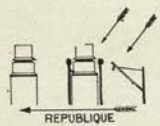
Gunnery Notes.—Loading positions, big guns: all round. Balanced turrets. Hoists, electric to all guns. Big guns manœuvred electrically. Secondary turrets, electric and hand. *Patrie's* big guns fire 3 rounds in 2 minutes; those of *Republique* are slower. 'Midship turrets cannot fire quite axially.

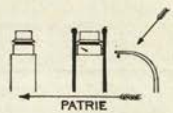
Arcs of fire: Amidship casemates 90°; other guns as for *Vérité*. *Patrie* has 1904 model torpedoes.

Height of guns above water: see *Vérité*.

Engineering Notes:—

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*	*Boilers*	*Present best speed*
Republique	Brest	Indret	Dec. '01	1906		19,626=19·1 (*max.*)	Niclausse	17·25
Patrie	La Seyne	F. & C., Medit.	1902	1906		19,010=19·47	Niclausse	18





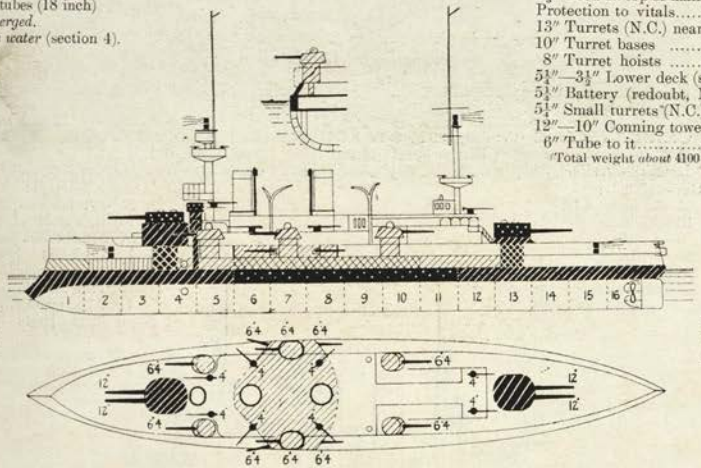
General Notes.—Cost about £1,420,000 per ship, *complete*.

SUFFREN (July, 1899).

Displacement, 12,750 tons. Complement, 730.
Length (*waterline*), 410 feet. Beam, 70 feet. *Maximum* draught, 28¼ feet. Length *over all*, 422½ feet.

Guns—(M. '96):
4—12 inch, 45 cal. (*AAAA*).
10—6·4 inch, 45 cal.
8—4 inch
22—3 pdr.
Torpedo tubes (18 inch)
2 *submerged*.
2 *above water* (section 4).

Armour:
12″ Belt (amidships) ..... *aaa*
9″ Belt (ends) ..... *aa*
3″ Deck (flat below belt) ...
1½″ Deck on top of main belt
Protection to vitals.....=*aaaaa*
13″ Turrets (N.C.) nearly...*aaaa*
10″ Turret bases ..... *aa*
8″ Turret hoists ..... *a*
5½″—3½″ Lower deck (side) *b-c*
5½″ Battery (redoubt, N.C.) *c*
5½″ Small turrets (N.C.) ... *c*
12″—10″ Conning tower ... *aaa*
6″ Tube to it..... *b*
(Total weight *about* 4100 tons)



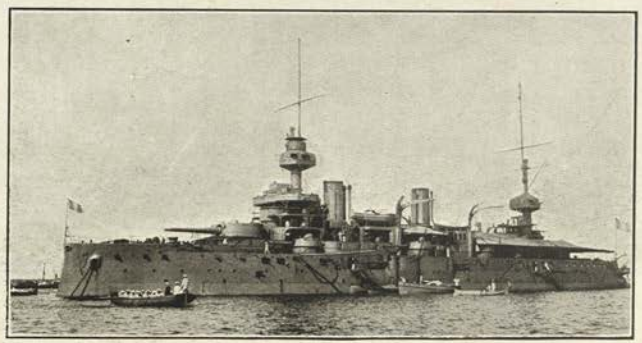
Ahead:
2–12 in.
6–6·4 in.
4–4 in.

Astern:
2—12 in.
6—6·4 in
4—4 in.

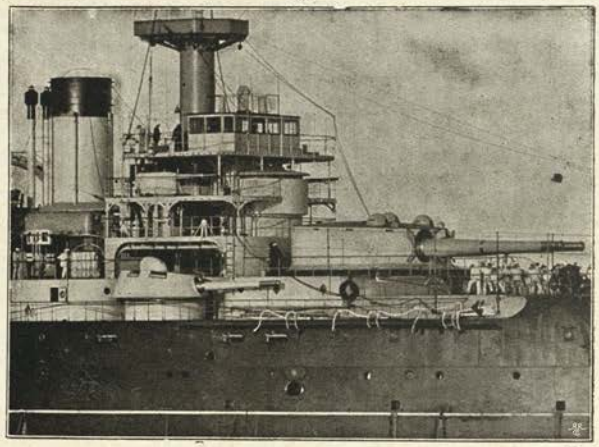
Broadside 4—12 in., 5—6·4 in., 4—4 in.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: Niclausse. Designed H.P. 16,200=18 kts.
Coal: *normal* 820 tons; *Maximum* 1150 tons; also 60 tons of oil.
Armour Notes.—Belt is 8¼ feet wide, 5 feet of it below waterline; lower edge averages 6″ thick.
Gunnery Notes.—Loading positions, big guns: all round. Balanced turrets. Hoists, electric for all guns. Big guns manœuvred electrically and hydraulic. Secondary turrets, electrically.
Arcs of fire: big guns 260°; midship secondary turrets 180°; other 6·4 in. guns 135° from axial line.
Ammunition carried: 12 in., 90 rounds per gun; 6·4 in., 150 rounds per gun.
Height of guns above water: bow turret 30 feet.
Engineering Notes.—Coal consumption about 10½ tons an hour at 12,000 H.P., and about 14½ tons at 16,000 H.P.—18 kts.
General Notes.—Cost, *complete*, £1,200,000. Conning tower in two compartments.

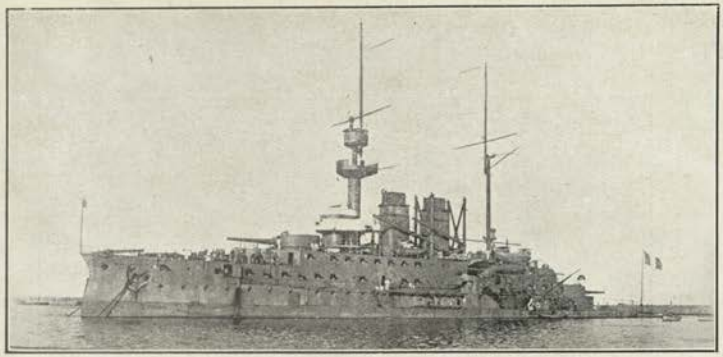
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*	*Boilers*	*Best recent speed*
Suffren	Brest Yard	Indret	Jan '99	1903	1908	16,715=18	Niclausse	16



SUFFREN. *Photo by favour of M. Gautrieu.*



Details of conning tower, etc. Starboard side.



HENRI IV (Aug., 1899). *Photo, Geiser.*

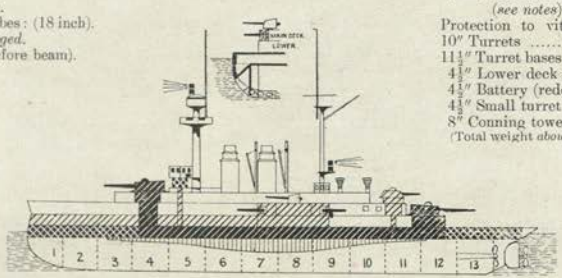
Displacement, 8948 tons. Complement, 400.

Length (*waterline*), 350 feet. Beam, 73 feet. *Maximum* draught, 24¾ feet. Length *over all*, 354½ feet.

Guns—(M. '93– '96):
2—10·8 inch, 45 cal. (*AAA*)
7—5·5 inch, 45 cal.
12—3 pdr.
2—1 pdr.

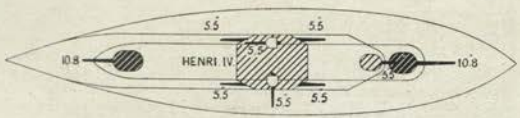
Torpedo tubes: (18 inch).
2 *submerged*.
(20° before beam).

Armour (Harvey-nickel):
11″ Belt (amidships) ... *aa*
8″ Belt (ends)..... *a*
5″—3″ Armour deck, flat (*see notes*).
Protection to vitals = *aaaaa*
10″ Turrets ..... *aa*
11½″ Turret bases..... *aa*
4½″ Lower deck side ... *c*
4½″ Battery (redoubt)... *c*
4½″ Small turret (aft)... *c*
8″ Conning tower ..... *a*
(Total weight *about* 3500 tons.



Ahead:
1—10·8 in.
4—5·5 in.

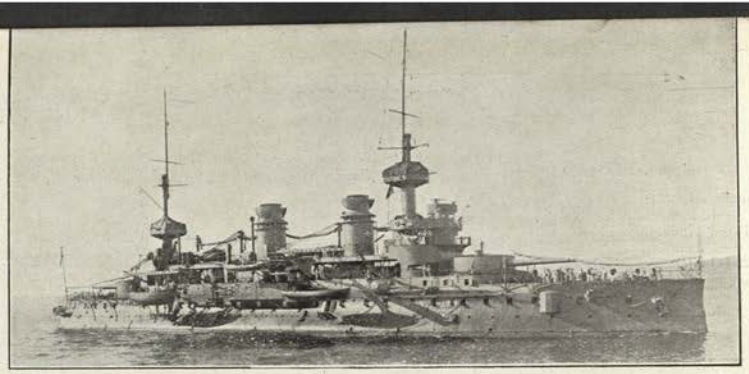
Astern:
1—10·8 in.
5—5·5 in.



Broadside: 2—10·8 in., 4—5·5 in.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: Niclausse. Designed H.P. 11,500 = 17·5 knots. Coal: *normal* 820 tons; *maximum* 1100 tons.

Height of guns above water: Bow turret, 28 feet; after turret, 16 feet; aft, 5·5 in. turret, 21 feet; battery guns, 15 feet.



Photo, Geiser.

CHARLEMAGNE (October, 1895), **ST. LOUIS** (September, 1896), **GAULOIS** (October, 1896).

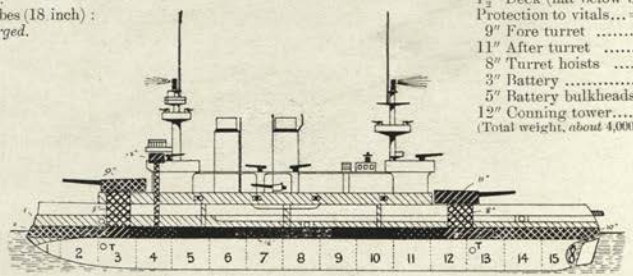
Displacement, 11,260 tons. Complement, 631.

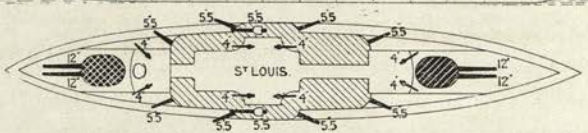
Length (*waterline*), 380¾ feet. Beam, 67½ feet. *Maximum* draught, 28 feet. Length *over all*, 387½ feet.

Guns (M. '93):
4—12 inch (*AAA*).
10—5·5 inch
8—4 inch
20—3 pdr.

Torpedo tubes (18 inch):
4 *submerged*.

Armour (Harvey):
16″ Belt (amidships) ...*aaaa*
10″ Belt (ends) (chrome) ...*a*
2¾″ Armour deck (flat on belt).
1¼″ Deck (flat below belt). ...
Protection to vitals... = *aaaaa*
9″ Fore turret .....*a*
11″ After turret .....*aa*
8″ Turret hoists .....*b*
3″ Battery .....*c*
5″ Battery bulkheads .....*d*
12″ Conning tower.....*aaa*
(Total weight, *about* 4,000 tons.)





Ahead:
2—12 in.
6—5·5

Astern:
2—12 in.
6—5·5

Broadside: 4—12 in., 5—5·5 in.

Machinery: 3 sets 4 cylinder triple expansion. 2 screws. Boilers: 20 Belleville. Designed H.P. 14,500 = 18 kts. Coal: *normal* 680 tons; *maximum* 1100 tons, also 200 tons oil.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials: 24 hrs. at 4 hrs. full power*	*Boilers*	*Present best speed*
Charlemagne	Brest		July,'94	1899	1908	9123 = 16·15 15,294 = 18·1	Belleville	
St. Louis	Lorient		Mar.,'95	1900	1908	= 16·2 = 18·31	Belleville	...
Gaulois	Brest	Ch. de la Loire	Jan.,'96	1899	1907	13,400 = 17·7 14,963 = 18·2	Belleville	...

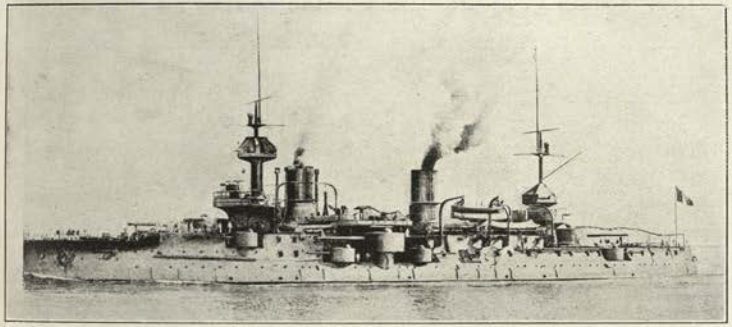


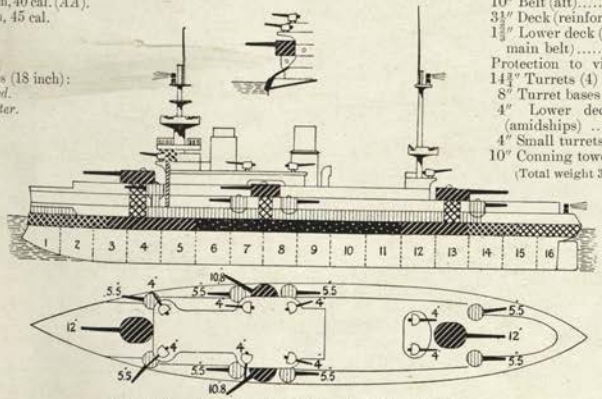
Photo by favour of M. Gautrieu.

BOUVET (April, 1896). Displacement, 12,205 tons. Complement, 630.

Length (*waterline*), 397 feet. Beam, 70½ feet. *Maximum* draught, 28½ feet. Length *over all*, 401½ feet.

Guns (M. '93, big guns; M.'91, secondary pieces):
2—12 inch, 40 cal. (*AAA*).
2—10·8 inch, 40 cal. (*AA*).
8—5·5 inch, 45 cal.
8—4 inch
10—3 pdr.
20—1 pdr.
Torpedo tubes (18 inch):
2 *submerged*.
2 *above water*.

Armour (*acier special durci*):
16″ Belt (amidships) ... *aaa*
12″ Belt (bow) ..... *aa*
10″ Belt (aft)..... *a*
3½″ Deck (reinforcing)...
1½″ Lower deck (topping main belt).....
Protection to vitals = *aaaaa*
14¾″ Turrets (4) ..... *aa*
8″ Turret bases ..... *b*
4″ Lower deck side (amidships) ..... *d*
4″ Small turrets (8) ... *d*
10″ Conning tower ..... *a*
(Total weight 3800 tons).



Ahead:
1—12 in.
2—10·8 in.
4—5·5 in.
2—4 in.

Astern:
1—12 in.
2—10·8 in.
4—5·5 in.
2—4 in.

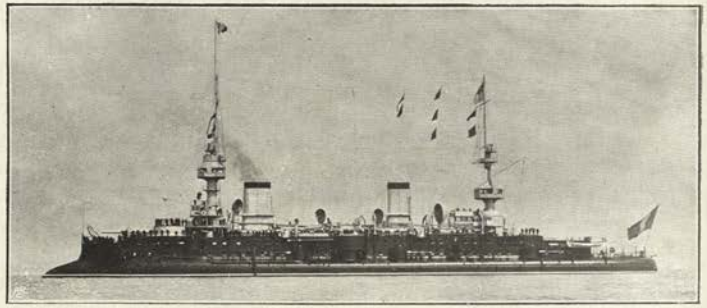
Broadside: 2—12 in., 1—10·8 in., 4—5·5 in., 4—4 in.

Machinery: 3 sets vertical triple expansion 3 cylinder. 3 screws. Boilers: 24 Belleville (1894 model), in 3 groups. Designed H.P. 14,000 = 17 kts. Coal: *normal* 620 tons; *maximum* 800 tons.

Armour Notes.—Belt is about 7½ feet wide; 4 feet of it below waterline; lower edge is 8″ and 5″ aft.

Height of guns above water: Bow turret, about 28 feet; other big turrets about 21 feet.

General Notes.—Laid down at Lorient, January, 1893. Completed 1898. Cost about £1,200,000.

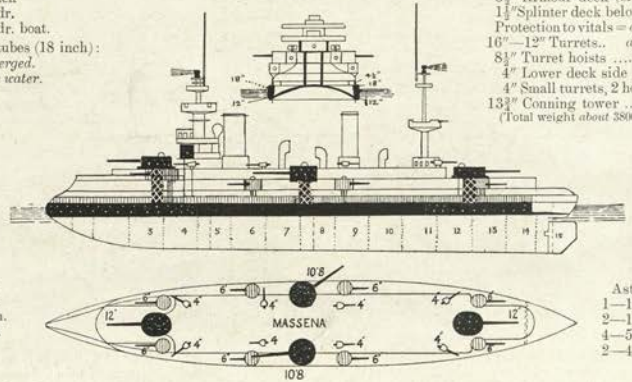


MASSENA (July, 1895). Displacement, 11,924 tons. Complement, 617.

Length (*waterline*), 380½ feet. Beam, 66¼ feet. *Maximum* draught, 27 feet. Length *over all*, 384 feet.

Guns—(M. 1893):
2—12 inch, 40 cal. (*AAA*).
2—10·8 inch, 40 cal. (*AA*).
8—5·5 inch
8—4 inch
12—3 pdr.
2—9 pdr. boat.
Torpedo tubes (18 inch):
2 *submerged*.
2 *above water*.

Armour (Harvey):
17¾″ Belt (amidships) *aaaa*
10″ Belt (ends) ..... *a*
9½″ Bulkhead (aft) .....*a*
3½″ Armour deck (slopes)
1½″ Splinter deck below this
Protection to vitals = *aaaaa*
16″—12″ Turrets.. *aaa-aa*
8½″ Turret hoists .....*a*
4″ Lower deck side .....*d*
4″ Small turrets, 2 hoists *d*
13¾″ Conning tower .....*aa*
(Total weight *about* 3800 tons).



Ahead:
1—12 in.
2—10·8 in.
4—5·5 in.
2—4 in.

Astern:
1—12 in.
2—10·8 in.
4—5·5 in.
2—4 in.

Broadside: 2—12 in., 1—10·8 in., 4—5·5 in., 4—4 in.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: 24 Lagrafel D'Allest. Designed H.P. 13,500 = 18 kts. Coal: *normal* 635 tons; *maximum* 800 tons, including oil.

Armour Notes.—Belt is 7½ feet wide by 350 feet long. 5 feet of it below waterline; lower edge is 13¾″ thick amidships. 4¾″ funnel bases, 3″ shields to 4 inch guns.

General Notes.—Laid down at St. Nazaire, 1892. Completed 1898. Cost, *complete*, over £1,100,000.

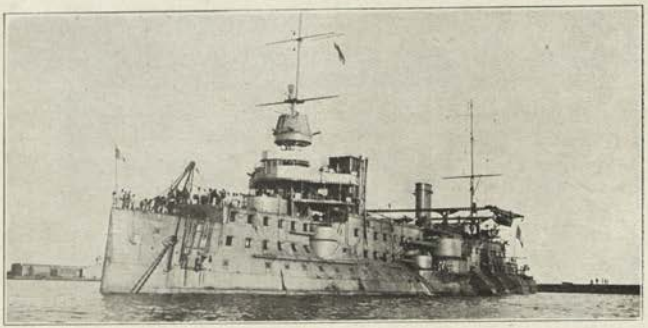
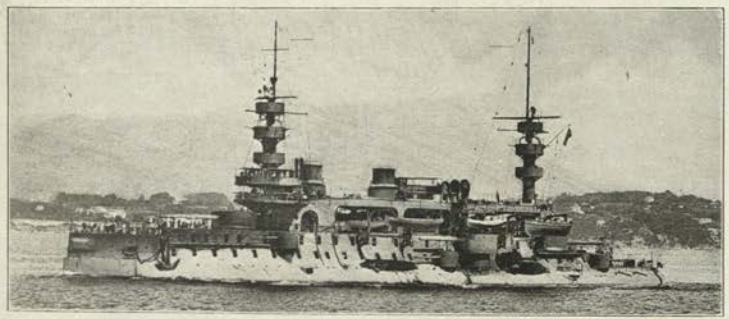
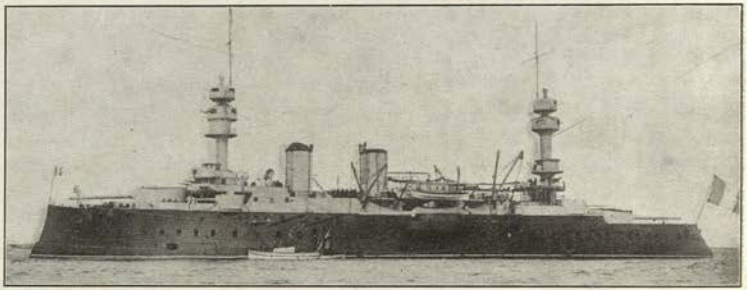


Photo by favour of M. Gautrieu.

CARNOT (1894). 12,150 tons. Complement 621. Dimensions: 380½ (*w.l.*) × 70½ × 28 (*max.*) feet Guns: 2—12 inch, 45 cal. (M. '91), 2—10·8, 45 cal. (M. '91), 8—5·5, 4—9 pdr., 18—3 pdr. Tubes (18 inch): 2 *sub.* Armour (steel): 17¾″—10″ belt, 13¾″ big guns, 4″ secondary, 6″ C.T. Designed H.P. 15,000 = 18 kts. Coal: *max.* 700 tons. D'Allest boilers.



CHARLES MARTEL (1893). 11,882 tons. Dimensions: 390 (*w.l.*) × 70½ × 27¾ feet (*max.*) Guns: 2—12 inch (M. '87). 2—10·8 (M. '87), 8—5·5, 4—9 pdr., 20—3 pdr. Tubes (18 inch): 2 *sub.* Armour (steel): 17¾″—11″ belt, 14¾″ big guns, 4″ secondary guns. Designed H.P. 14,500 = 18 kts. Coal: *max.* 1000 tons (including oil). D'Allest boilers.



JAURÉGUIBERRY (1893). 11,900 tons. Comp. 607. Dimensions: 364 (*w.l.*) × 72½ × 29 (*max.*) feet. Guns: 2—12 inch (M. '91), 2—10·8 (M. '87), 8—5·5, 16—3 pdr. Tubes: 2—18 inch (*sub.*) Armour (steel): 17¾″ – 9¾″ belt; 14½″ turrets, 4″ small guns, 9″ C.T. Designed H.P. 14,300 = 17·8 kts. Coal: *max.* 1,100 tons, including oil. D'Allest boilers.

1905 NEW FRENCH ARMOURED CRUISERS (23 knots).

(Waldeck Rousseau Class—2 Ships).

EDGAR QUINET (Sept., 1907), **WALDECK ROUSSEAU** (March, 1908).

Normal displacement, 14,000 tons. Complement, 738.

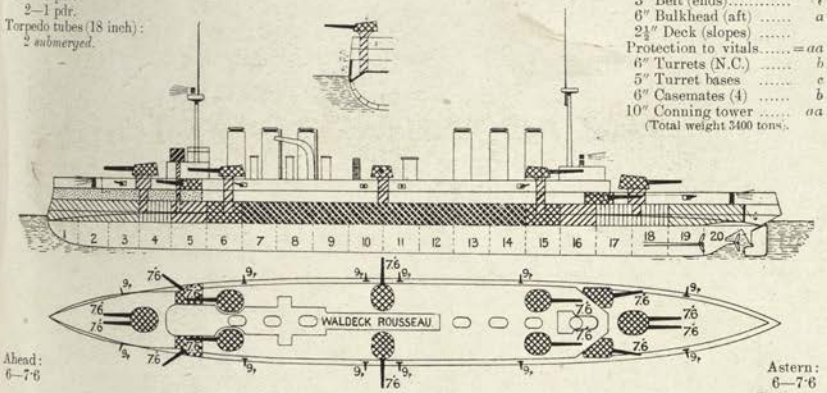
Length (*waterline*), 515 feet. Beam, 70½ feet. *Mean* draught, 27 feet. Length *over all*, 527½ feet.

Guns—(M. '02):
14—7·6 inch, 45 cal. (*A*).
20—9 pdr.
2—1 pdr.

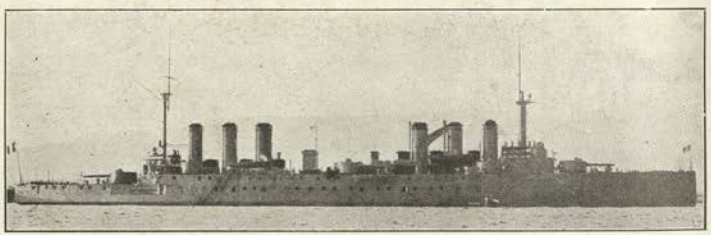
Torpedo tubes (18 inch):
2 *submerged*.

Armour:

6¾″ Belt (amidship) ...	*a*
3″ Belt (ends).....	*c*
6″ Bulkhead (aft)	*a*
2½″ Deck (slopes)	
Protection to vitals.....=	*aa*
6″ Turrets (N.C.)	*b*
5″ Turret bases	*c*
6″ Casemates (4)	*b*
10″ Conning tower	*aa*
(Total weight 3400 tons).	



Broadside: 9—7·6 in.



Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: 40. *See Notes.* Designed H.P. 36,000=23 knots. Coal: *normal* 1,242 tons; *maximum* 2,300 tons. *Nominal endurance:* 11,000 miles at 10 kts.

Armour Notes.—Belt is 12¼ feet wide. 4¾ feet of it below waterline. Upper edge 5″ thick; bottom 3½″.

Gunnery Notes.—Loading positions: all round. Hoists: electric to all guns. All guns manœuvred electrically and hand. Arcs of fire: Double turrets 270°; single turrets 150°; casemates 110°.

Height of guns above water: Bow and secondary turrets, 29½ feet; after turret, 22 feet. Forward casemates, 20 feet; after casemates, 12 feet.

Torpedo Notes.—1904 model torpedoes.

Engineering Notes.—Most auxiliary machinery: electric. Grate area: 2486½ sq. feet. Heating surface: 81,860 sq. feet. 136 r.p.m.=23 kts.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials:* 30 *boilers* 10 *hours*	*Full power* 3 *hours*	*Boilers*	*Best recent speed*
E. Quinet	Brest Yard		Nov.,'05	1910	36,828=23·8	39,808=23·92	Belleville	
W. Rousseau	Lorient Yard		June,'06	1910		36,110=23·1	Niclausse	

Estimated cost: *Edgar Quinet*, £1,247,035; *Waldeck Rousseau*, £1,226,593.

E. Quinet on consumption trials at 19·5 kts. (16,705 I.H.P.) burned 1·29 lbs. per h.p. At full power, 1·675 lbs. per h.p.

1904 FRENCH ARMOURED CRUISER (22 knots).

JULES MICHELET (Aug., 1905).

Displacement 12,600 tons. Complement 724

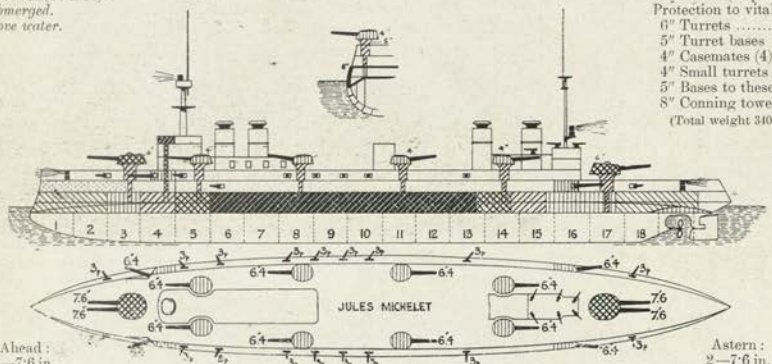
Length (*waterline*): 485 feet Beam, 70 feet. *Mean* draught, 27 feet. Length *over all*, 493 feet.

Guns—(M. '02):
4—7·6 inch, 45 cal. (*A*).
12—6·4 inch, 50 cal.
24—3 pdr.
Torpedo tubes (18 inch):
2 *submerged*.
2 *above water*.

Armour:

6¾″ Belt (amidship) ...	*a*
3″ Belt (ends)	*e*
6″ Bulkhead (aft)	*a*
2½″ Deck (slopes)	
Protection to vitals.....	= *aa*
6″ Turrets	*b*
5″ Turret bases	*c*
4″ Casemates (4)	*d*
4″ Small turrets (8) ...	*d*
5″ Bases to these	*c*
8″ Conning tower	*a*

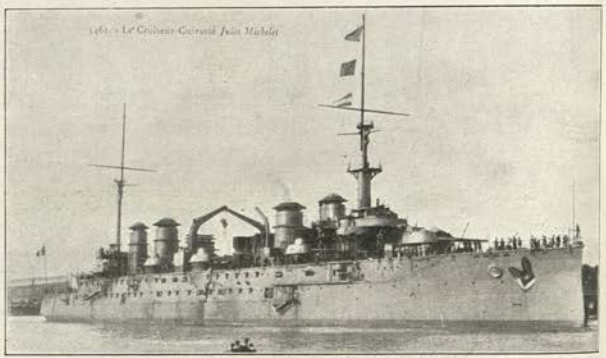
(Total weight 3400 tons).



Ahead:
2—7·6 in.
6—6·4 in.

Broadside: 4—7·6 in., 6—6·4 in.

Astern:
2—7·6 in.
6—6·4 in.



Photo, Laurent.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: 20 Du Temple-Guyot. Designed H.P. 29,000 = 22 knots. Coal: *normal* 1400 tons; *maximum* 2300 tons.

Armour Notes.—Belt is 12¼ feet wide. 4¼ feet below waterline. Upper edge 5″ thick; bottom 3½″.

Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric to all guns. All guns manœuvred electrically and hand.
Arcs of fire: Big turrets, 240°; secondary turrets, 150°; casemates, 110°.
Height of guns above water: Bow and secondary turrets, 29 feet; after turret, 22 feet.

Torpedo Notes.—1904 model torpedoes.

Engineering Notes.—Made her speed on trial with 15 boilers only.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*	*Boilers*	*Best recent speed*
J. Michelet	Lorient		June '04	1908		(*mean*). 30,190 = 22·86	Guyot	23·1

General Notes.—Estimated cost £1,233,709.

1903 FRENCH ARMOURED CRUISER (23 knot).

ERNEST RENAN (March, 1906),

Normal displacement 13,644 tons. Complement 750.

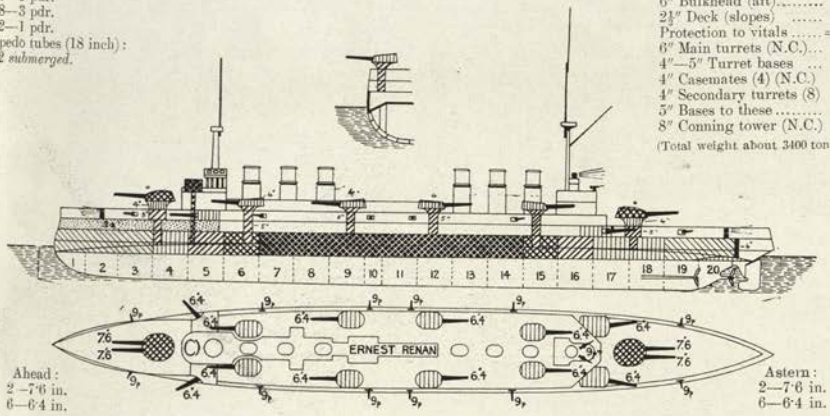
Length (*waterline*), 515 feet. Beam, 70¼ feet. *Mean* draught, 27 feet.

Guns—(M. '02):
4—7·6 inch, 45 cal. (*A*)
12—6·4 inch, 50 cal.
16—9 pdr.
8—3 pdr.
2—1 pdr.
Torpedo tubes (18 inch):
2 *submerged*.

Armour:

6¾″ Belt (amidships) ...	*a*
3½″ Belt (ends)	*e*
6″ Bulkhead (aft).....	*a*
2½″ Deck (slopes)	
Protection to vitals .....=	*aa*
6″ Main turrets (N.C.)...	*b*
4″—5″ Turret bases	*d-e*
4″ Casemates (4) (N.C.)	*d*
4″ Secondary turrets (8)	*d*
5″ Bases to these.....	*e*
8″ Conning tower (N.C.)	

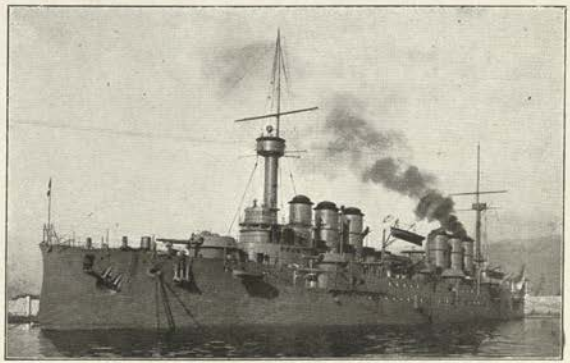
(Total weight about 3400 tons).



Ahead:
2—7·6 in.
6—6·4 in.

Astern:
2—7·6 in.
6—6·4 in.

Broadside: 4—7·6 in., 6—6·4 in.



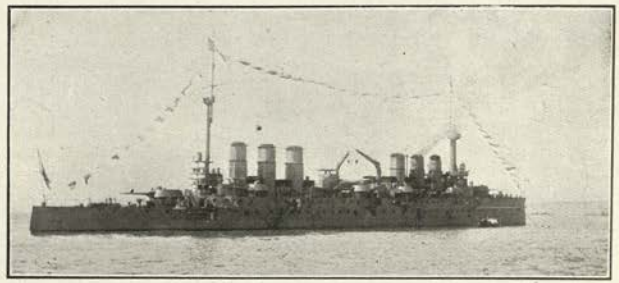


Photo by favour of M. Gautrieu.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: Niclausse. Designed H.P. 37,000=23 kts. Coal: *normal* 1350 tons; *maximum* 2300 tons, including oil, etc. *Nominal endurance*: 10,000 miles at 10 kts.

Armour Notes.—Belt is 12½ feet wide, 4¾ feet of it below waterline. Upper edge 5″ thick; bottom 3½″.

Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric to all guns. All guns manœuvred electrically and hand.

Arcs of fire: Big turrets 240°; secondary turrets 150°; casemates 110°.

Height of guns above water: Bow and secondary turrets, 29½ feet; after turret, 22 feet. Forward casemates, 20 feet; after casemates, 12 feet.

Torpedo Notes.—1904 model torpedoes.

General Notes.—Cost (estimated), £1,444,434.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*	*Boilers*	*Best recent speed*
E. Renan	St. Nazaire	St. Nazaire	Oct. '03	1908		22,560=21·3 37,700=24·24	Niclausse	24·2

(Gambetta Class—3 Ships.)

LÉON GAMBETTA (October, 1901), **JULES FERRY** (August, 1903), & **VICTOR HUGO** (March, 1904).

Displacement 12,416 tons. Complement 710.

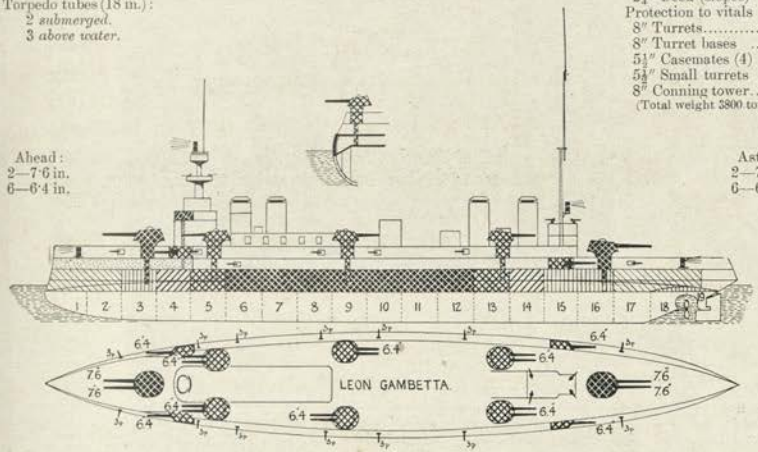
Length (*waterline*), 476 feet. Beam, 70½ feet. *Mean* draught, 26½ feet. Length *over all*, 486¾ feet.

Guns (M. '96):
4—7·6 inch, 45 cal. (*A*).
16—6·4 inch, 45 cal.
24—3 pdr.
Torpedo tubes (18 in.):
2 *submerged*.
3 *above water*.

Armour: *a*
6¾″ Belt (amidships) *c*
3″ Belt (ends) ..... *b*
5″ Bulkhead (aft) ...
2½″ Deck (slopes)
Protection to vitals = *aa*
8″ Turrets..... *a*
8″ Turret bases ... *a*
5½″ Casemates (4) *b*
5½″ Small turrets *b*
8″ Conning tower... *a*
(Total weight 3800 tons).

Ahead:
2—7·6 in.
6—6·4 in.

Astern:
2—7·6 in.
6—6·4 in.



Broadside: 4—7·6 in., 8—6·4 in.

Machinery: 3 sets vertical 4 cylinder triple expansion. 3 screws. Boilers: various (see *Notes*). Designed H.P. 27,500=22 kts. Coal: *normal* 1320 tons; *maximum* 2100 tons and oil. *Nominal* radius at 10 kts., 12,000; at 22 kts., 1500 miles.

Armour Notes.—Belt 12½ feet wide, 4¾ feet of it below waterline; upper and lower edges amidships 5″ thick. There is 1½″ main deck. Belt at bow is 17 feet above water line, amidships 7½ feet.

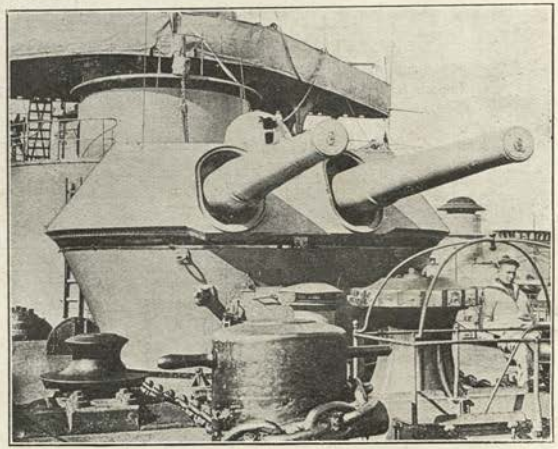
Gunnery Notes.—Loading positions, big guns: all round. Hoists, electric all guns. All guns manœuvred electrically and by hand. Very clear gun decks.
Arcs of fire: Big turrets, 250°; Secondary turrets, 160°; Casemates, 110°.
Height of guns above water: Bow and secondary turrets, 29 feet; after turret, 22 feet.

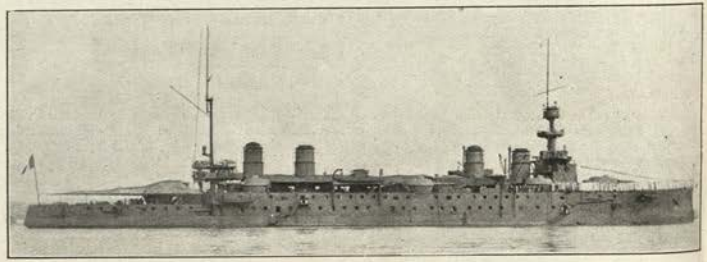
Torpedo Notes.—*Victor Hugo* 1904 model torpedoes; others, earlier type.

Engineering Notes.—Engines and boilers weigh 1808 tons. These ships steam well. Consumption at 16,000 H.P. averages 11½ tons an hour. *J. Ferry* on trial burned 1·4 lb. per I.H.P. at 16,000 H.P. Heating surface, 55,680 square feet; grate area, 1660 square feet; funnel tops 69 feet above furnace bars.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials:—* *24 hours at 16,000 H.P.*	*Mean 3 hours full at 27,500*	*Boilers*	*Present best speed*
Leon Gambetta	Brest	St. Nazaire	Jan., '01	1903		16,990=	29,008=23·15	Niclausse	23
Jules Ferry	Cherbourg	Indret	Oct., '01	1906		16,508=	29,200=23	Guyot	21
Victor Hugo	Lorient	Indret	Ap'l, '03	1906		=	28,735=22·86	Belleville	23·1

General Notes.—Cost: *Gambetta*, £1,177,667; *J. Ferry*, £1,155,915; *V. Hugo*, £1,209,487.





Gambetta. *Photo, Lieut. Moseley, C.F.A.*

General Notes.—Excellent steamers. Can average 17-18 kts. with half boilers. Have done 18 kts. for 72 hours continuously, and for 24 hours 19·2-19·7 kts.

Differences.—In *V. Hugo* the ventilators between the funnels are *very conspicuous*; and she has derricks amidships instead of cranes.

1899 FRENCH ARMOURED CRUISERS (21 knot).

(Aube Class.—4 Ships).

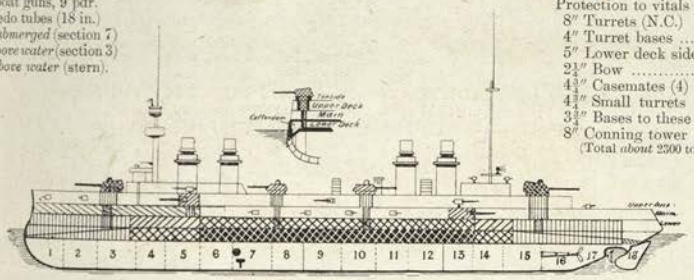
GLOIRE (June, 1900), **MARSEILLAISE** (July, 1900), **CONDÉ** (March, 1902), and **AMIRAL AUBE** (May, 1902).

Displacement 10,000 tons. Complement 612.

Length (*waterline*), 452¾ feet. Beam, 63½ feet. *Maximum* draught, 26½ feet. Length *over all*, 460 feet.

Guns (M. '96):
2—7·6 inch, 40 cal. (*A*)
8—6·4 inch. 45 cal.
6—4 inch.
18—3 pdr.
2 boat guns, 9 pdr.
Torpedo tubes (18 in.)
2 *submerged* (section 7)
2 *above water* (section 3)
1 *above water* (stern).

Armour:
6¾″ Belt (amidships) *a*
4″ Belt (ends) ..... *d*
4″ Bulkheads ..... *d*
2½″ Deck (slopes) ...
Protection to vitals = *aa*
8″ Turrets (N.C.) ... *a*
4″ Turret bases ..... *d*
5″ Lower deck side *b*
2½″ Bow ..... *e*
4¾″ Casemates (4) ... *c*
4¾″ Small turrets (4) *c*
3¾″ Bases to these ... *d*
8″ Conning tower ... *a*
(Total *about* 2300 tons).



Ahead:
1—7·6
4—6·4
2—4

Astern:
1—7·6
4—6·4
2—4

Broadside: 2—7·6 in., 8—6·4 in., 3—4 in.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: Belleville and Niclausse. Designed H.P. 20,500 = 21 knots. Coal: *normal* 970 tons; *maximum* 1590 tons.

Armour Notes.—Belt is 6½ feet wide, 3¼ feet of it below waterline. Lower edge amidships is 3½″ thick.

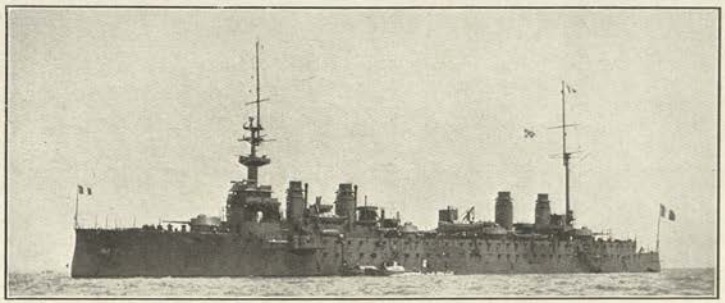
Gunnery Notes.—Loading positions, big guns: all round. Hoists, electric all guns. Big guns manœuvred electrically and hand. All machinery inside hoists.
Arcs of fire: 7·6 in. about 250°; Secondary turrets 150°; Casemates 110°.

Engineering Notes:—

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials:*— *24 hours at 10,000*	*3 hours full power*	*Boilers*	*Last recorded f. speed*
Gloire	Lorient	Lorient	Sep., '99	1904		10,788 = ...	21,400 = 21·58	Niclausse	21·3
Marseillaise	Brest	Ch. d. la Loire	Jan.,'00	1903		10,658 = 18·5	21,820 = 21·64	Belleville	21·6
Condé	Lorient	F. & C., Medit.	Mar.,'01	1904		10,500 = ...	22,175 = 21·35	Niclausse	21·7
A. Aube	St. Nazaire	St. Nazaire	Aug.'00	1904		10,800 = 18·6	22,258 = 21·87	Belleville	22

Coal consumption: *Aube* on trials burned only 1·29 lbs. per I.H.P., at 10,000 H.P. All these ships steam well.

General Notes.—Cost on the average £875,000 per ship. A fifth ship (*Sully*) lost February, 1905.

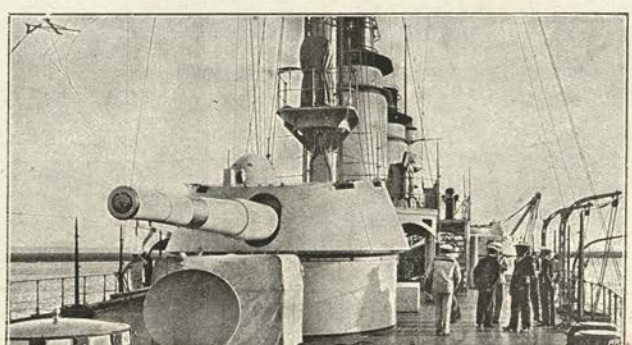


Gloire. *Photo, Hopkins.*

Differences:—

Name.		*Notes.*
Marseillaise	Large ventilators between funnels	
Gloire	Triatic wireless cable high up	Steam pipes abaft first two funnels
Condé	Triatic wireless just above tops	Steam pipes abaft first two funnels
A. Aube	Main topmast before instead of abaft	

(*See Montcalm class.*)



1899 FRENCH ARMOURED CRUISERS (21 knot).

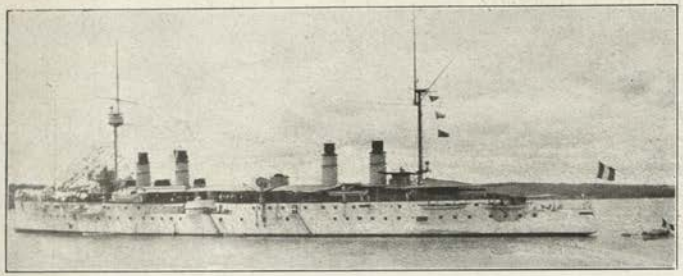
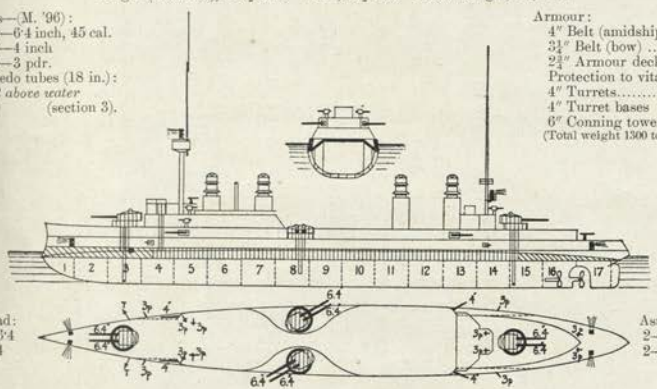


Photo Lieut. Moseley, C.F.A

DUPLEIX (April, 1900), **DESAIX** (March, 1901), & **KLÈBER** (September, 1902).
Displacement 7,700 tons. Complement 520.
Length (*waterline*), 426½ feet. Beam, 58½ feet. *Mean* draught, 24¼ feet.

Guns—(M. '96):
8—6·4 inch, 45 cal.
4—4 inch
10—3 pdr.
Torpedo tubes (18 in.):
2 *above water*
(section 3).

Armour:
4″ Belt (amidships) *d*
3¼″ Belt (bow) ..... *e*
2¾″ Armour deck... *b*
Protection to vitals *b*
4″ Turrets..... *d*
4″ Turret bases ... *d*
6″ Conning tower *b*
(Total weight 1300 tons)



Ahead:
2—6·4
2—4

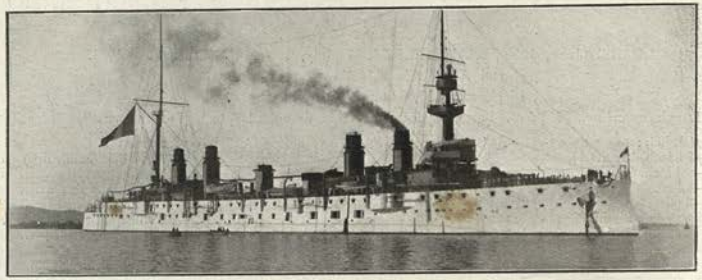
Astern:
2—6·4
2—4

Broadside: 6—6·4 in., 2—4 in..

Machinery: 3 sets 3 cylinder vertical triple expansion. 3 screws. Boilers: 20 Belleville or Niclausse. Designed H.P. 17,000=21 knots. Coal: *normal* 880 tons; *maximum* 1200 tons, *including* oil.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials:* 24 hours at 10,000.	*Trials:* 3 hours at 17,000.	*Boilers*	*Best recent speed*
Dupleix	Rochefort	F. & C. Medit.	1899	1903		10,022=18·5	17,715=20·9	Belleville	21·35
Desaix	St. Nazaire	Indret	Jan.,'99	1904		10,496=18·6	17,979=20·61	Belleville	21·1
Kleber	Bordeaux	Creusot	1899	1903		10,510=18·9	17,730=21·25	Niclausse	21·27

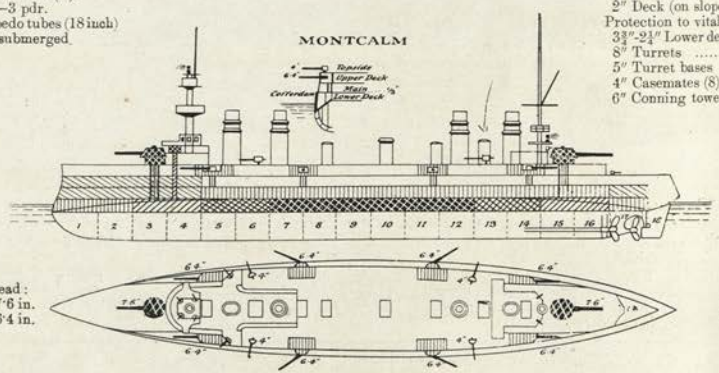
FRENCH ARMOURED CRUISERS (21 knot). **1897**



GUEYDON (September, 1899), **MONTCALM** (March 1900), **DUPETIT THOUARS** (July, 1901).
Displacement 9517 tons. Complement 540 (flagship 583).
Length (*waterline*), 452¾ feet. Beam, 63¾ feet. *Mean* draught, 24½ feet. Length *over all*, 460 feet.

Guns:
2—7·6 inch, M. '93 (*B*).
8—6·4 inch, M. '91
4—4 inch (*F*).
16—3 pdr.
Torpedo tubes (18 inch)
2 submerged.

Armour (Harvey Nickel):
6¾″ Belt (amidships) ... *a*
4″ Belt (ends) ..... *d*
3″ Forecastle ..... *e*
2″ Deck (on slopes)..... *a*
Protection to vitals.....=*aa*
3¾″-2¼″ Lower deck side *d-e*
8″ Turrets ..... *a*
5″ Turret bases ..... *d*
4″ Casemates (8) ..... *d*
6″ Conning tower ..... *b*

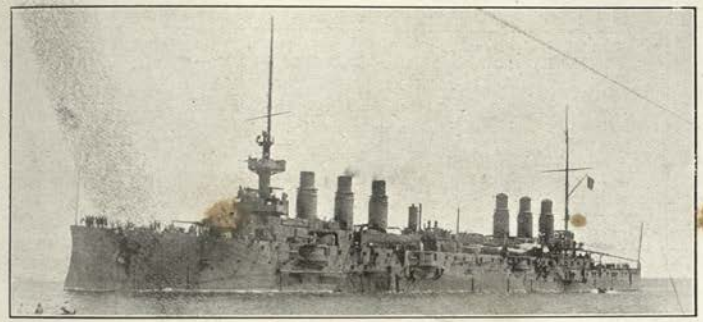


Ahead:
1—7·6 in.
4—6·4 in.

Astern:
1—7·6 in.
4—6·4 in.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: various (*see notes*). Designed H.P. 19,600=21 kts.
Coal: *normal* 1,000 tons; *maximum* 1,600 tons, including oil.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials:* 24 hrs. at 10,000	*Trials:* 3 hrs. full p.	*Boilers*	*Best recent speed*
Gueydon	Lorient	Indret	May,'97	1902	1908	=	19,664=20·3	Niclausse	20·5
Montcalm	La Seyne	F. & C. Medit.	Jan.,'98	1902	1908	=	=21	Normand	21·1
D. Thouars	Toulon		Apl.,'99	1903		10,977=17·92	20,382=21·38	Belleville	20



(Training Ship for Midshipmen.) **JEANNE D'ARC** (June, 1899). *Photo, Geiser.*

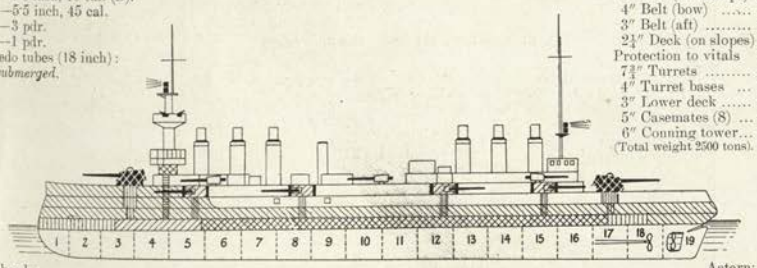
Displacement 11,270 tons. Complement 626.

Length (*waterline*), 475¾ feet. Beam, 70 feet. *Maximum* draught, 27 feet

Guns—(M. '93):
2—7·6 inch, 45 cal. (*B*).
14—5·5 inch, 45 cal.
12—3 pdr.
8—1 pdr.

Torpedo tubes (18 inch):
2 *submerged*.

Armour (Harvey):
6″ Belt (amidships) *b*
4″ Belt (bow) ..... *d*
3″ Belt (aft) ..... *e*
2¼″ Deck (on slopes)
Protection to vitals *a*
7¾″ Turrets ..... *a*
4″ Turret bases ... *d*
3″ Lower deck ..... *e*
5″ Casemates (8) ... *c*
6″ Conning tower... *b*
(Total weight 2500 tons).



Broadside: 2—7.6 in. 7—5·5 in.

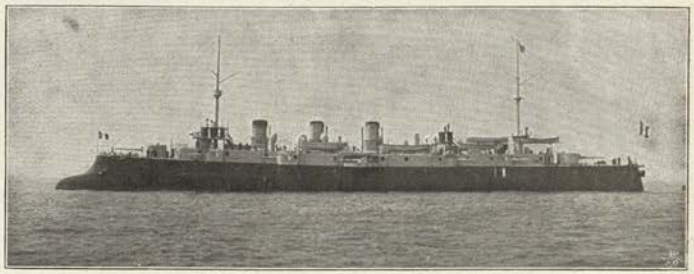
Machinery: 3 sets vertical inverted triple expansion. 3 screws. Boilers: Du Temple (small tube). Designed H.P. 28,500 = 23 kts. (Best actual: 21·7). Coal: *normal* 1400 tons; *maximum* 2100 tons and liquid fuel.

Armour Notes—Belt is 7½ feet wide; 5 feet of it below waterline; lower edge is 4″ thick.

Gunnery Notes—Loading positions, big guns: all round. Balanced turrets. Hoists: electric for all guns (separate). Big guns manœuvred electrically. Hoists pass through engine rooms.
Height of guns above water: bow turret, 29 feet; after turret *about* 21 feet.

Engineering Notes—Coal consumption: about 27 tons an hour at full power (28,500 H.P.) Cannot make her speed.

General Notes—Laid down at Toulon, October, 1896. Completed 1903. Cost: over £900,000.



Photo, W. Nye, Esq.

POTHUAU (1895).

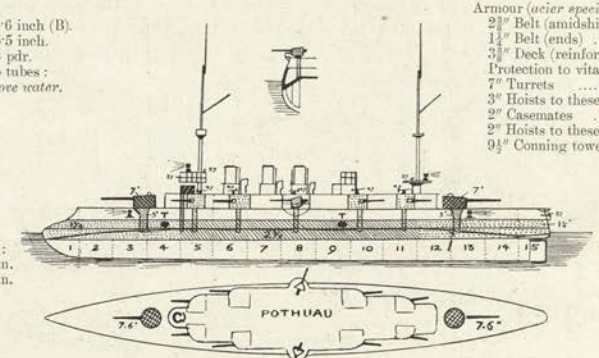
Displacement 5,360 tons. Complement 463.

Length (*waterline*), 370¾ feet. Beam, 50 feet. *Maximum* draught, 22½ feet.

Guns:
2—7·6 inch (B).
10—5·5 inch.
10—3 pdr.

Torpedo tubes:
4 *above water*.

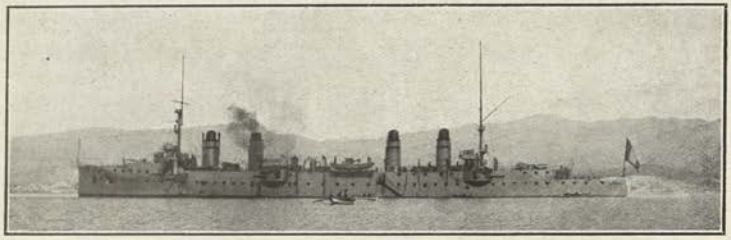
Armour (*acier special durci*):
2¾″ Belt (amidships) ..... *e*
1½″ Belt (ends) ..... *f*
3¾″ Deck (reinforcing belt)
Protection to vitals .....=*c*
7″ Turrets ..... *b*
3″ Hoists to these ..... *e*
2″ Casemates ..... *f*
2″ Hoists to these ..... *f*
9½″ Conning tower ..... *aa*



Broadside: 2—7·6 in., 5—5·5 in.

Machinery: 2 sets horizontal triple expansion. 2 screws. Boilers: 16 Belleville (old type). Designed H.P. 10,000 = 19 kts. Coal: *normal* 538 tons; *maximum* 638 tons.
On first *Trials*, I.H.P. 10,200 = 19·2 kts. She can still touch 19 knots.

Notes—The belt is carried up to the main deck, and the ship is generally a reduced copy of the *Dupuy de Lôme*, or an enlarged *Charner*. All guns have electric appliances, and the machinery of all is entirely protected by the turrets and hoists. The ship is a good sea boat. Laid down at Granville, 1893. Completed, 1896. Cost £384,000.



Photo, Spartali.

Distinctions.—Differs in appearance from *Montcalm* and *Aube* classes in foremast, and generally smaller look. Lower in the water.

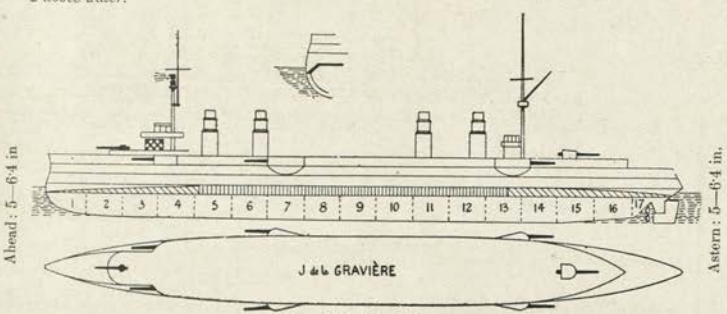
JURIEN DE LA GRAVIÈRE (July, 1899).

Displacement 5685 tons. Complement 511.

Length (*waterline*), 440 feet. Beam, 48⅔ feet. *Mean* draught, 22 feet.

Guns:
8—6·4, 45 cal.
10—3 pdr.
Torpedo tubes:
2 *above water.*

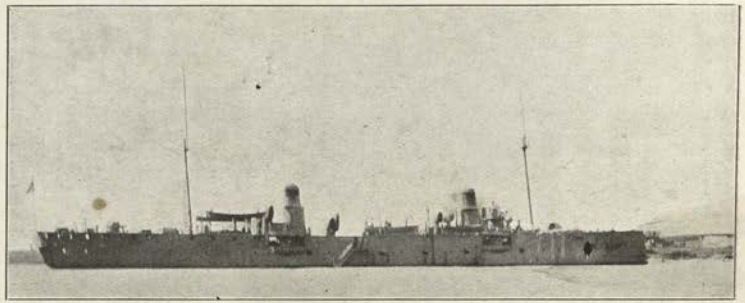
Armour (Harvey Nickel):
3″ Deck..... = *d*
(Cellulose belt).
6½″ Conning tower ..... *a*



Broadside: 5—6·4 in.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers: Guyot. Designed H.P. *full power* 17,000=23 kts. (not yet made). Coal: *normal* 600 tons; *maximum* 900 tons.

Laid down at Lorient, Nov., 1897. Completed 1901. Cost about £476,000.



Photo, Lieut. Moseley, C.F.A.

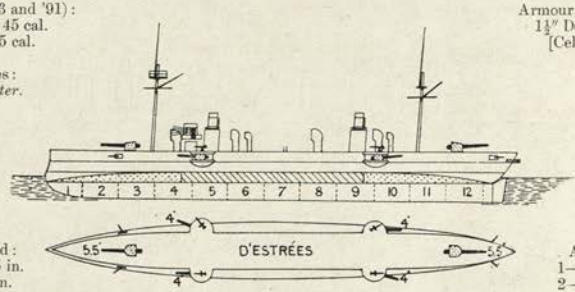
D'ESTRÉES (October, 1897).

Displacement 2460 tons. Complement 234.

Length (*waterline*), 312 feet. Beam, 39½ feet. *Mean* draught, 16 feet.

Guns—(M '93 and '91):
2—5·5 in., 45 cal.
4—4 in., 45 cal.
8—3 pdr.
Torpedo tubes:
3 *above water.*

Armour (hard steel):
1½″ Deck ..... = ϵ
[Cellulose belt.]



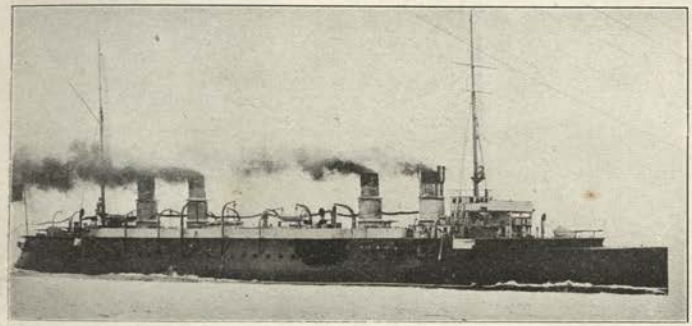
Ahead:
1—5·5 in.
2—4 in.

Astern:
1—5·5 in.
2—4 in.

Broadside: 2—5·5 in., 2—4 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: Lagrafel D'Allest. Designed H.P. 8500=21 kts. Coal: *normal* 345 tons; *maximum* 480 tons.

General Notes.—Built at Rochefort. Cost about £210,000.



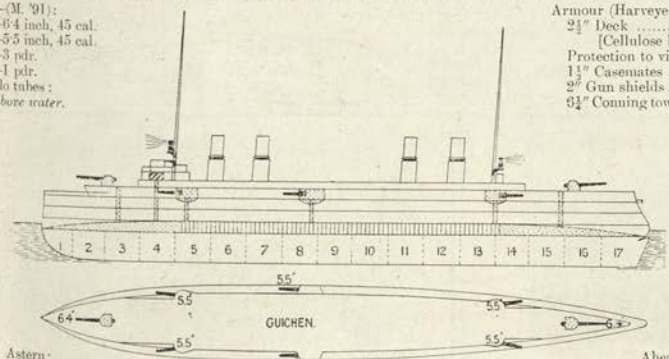
GUICHEN (May, 1898).

Displacement, 8,277 tons (sheathed). Complement, 625.

Length (*waterline*), 436½ feet. Beam, 55 feet. *Maximum* draught, 27 feet.

Guns—(M. '91):
2—6·4 inch, 45 cal.
6—5·5 inch, 45 cal.
10—3 pdr.
5—1 pdr.
Torpedo tubes:
2 *above water.*

Armour (Harveyed):
2½″ Deck ..... = *d*
[Cellulose belt].
Protection to vitals ... = *d*
1½″ Casemates ..... *f*
2″ Gun shields .....
6¼″ Conning tower (fore) *e*



Astern:
1—6·4
4—5·5

Ahead:
1—6·4
4—5·5

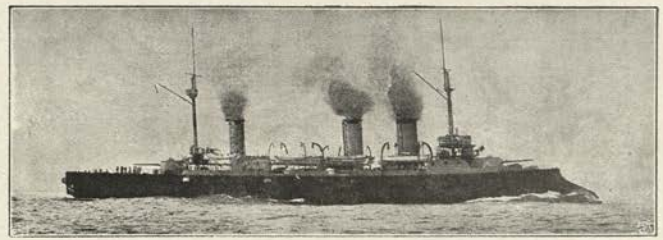
Broadside: 2—6·4 in., 3—5·5 in.

Machinery: 3 sets 4 cylinder triple expansion. 3 screws. Boilers: 36 Lagrafel d'Allest. Designed H.P. 24,000 = 23 kts. Coal: *normal* 1,460 tons; *maximum* 2,000 tons and liquid fuel.

Notes.—The armour deck rises amidships to 4½ feet above the waterline.

On *trial*: 24 hours *n.d.* I.H.P. 18,500 = 20 knots; 4 hours *f.d.* I.H.P. 25,455 = 23·55 knots.

Laid down at St. Nazaire, 1895. Completed 1902. Cost about £650,000.



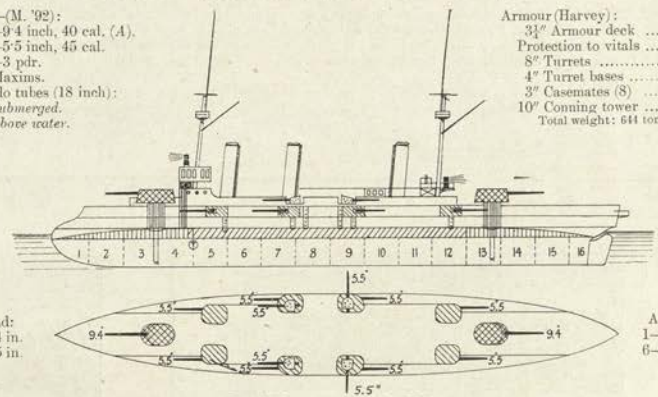
D'ENTRECASTEAUX (June, 1896).

Displacement, 8,114 tons. Complement, 521.

Length (*waterline*), 393½ feet. Beam, 58½ feet. *Maximum* draught, 26 feet.

Guns—(M. '92):
2—9·4 inch, 40 cal. (*A*).
12—5·5 inch, 45 cal.
12—3 pdr.
4 Maxims.
Torpedo tubes (18 inch):
2 *submerged.*
4 *above water.*

Armour (Harvey):
3¼″ Armour deck ..... = *e*
Protection to vitals ..... = *e*
8″ Turrets ..... *b*
4″ Turret bases ..... *d*
3″ Casemates (8) ..... *c*
10″ Conning tower ..... *a*
Total weight: 644 tons.



Ahead:
1—9·4 in.
6—5·5 in.

Astern:
1—9·4 in.
6—5·5 in.

Broadside: 2—9·4 in., 6—5·5 in.

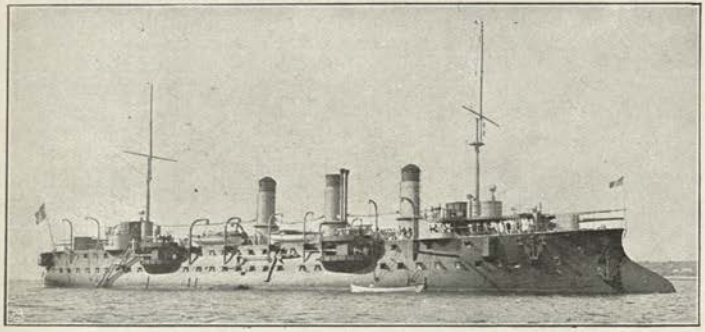
Machinery: 2 sets triple expansion. 2 screws. Boilers: Cylindrical (5 double ended). Designed H.P. 13,500 = 19·5 kts. Coal: *normal*, 650 tons; *maximum*, 1,000 tons. *Also* oil.

Gunnery Notes.—Electric hoists to each gun. Big gun turrets, electrically manœuvred.

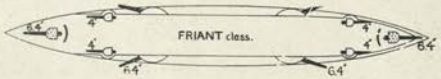
Ammunition carried: 9·4 in., 75 rounds; 5·5 in., 200 rounds per gun.

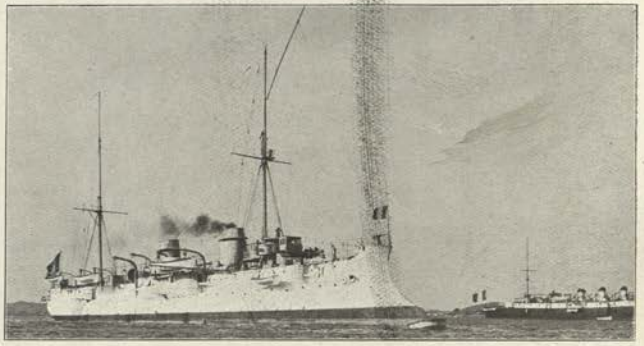
Engineering Notes.—The ship has never made her designed speed—19·2 being her *maximum* on a 4 hours trial, and her present speed is not over 18 knots, if as much. Coal consumption: about 15½ tons an hour, at 13,500 H.P. and *pro rata*.

General Notes.—Laid down at La Seyne, June, 1894, and completed 1898. Cost, about £670,000.



DU CHAYLA (1895). 4,000 tons. Complement, 393. Length (*waterline*), 325½ feet. Beam, 45 feet. *Maximum* draught, 23 feet. Guns—(M. '87): 6—6·4 inch, 45 cal., 4—4 inch, 4—3 pdr., 11—1 pdr. 2—14 inch tubes *above water*. Armour: 3″ Deck, 2″ Sponsons to the four main deck 6·4 inch guns. Designed H.P. 9500=19 kts. Coal: *maximum*, 624 tons. Boilers: Lagrafel d'Allest.



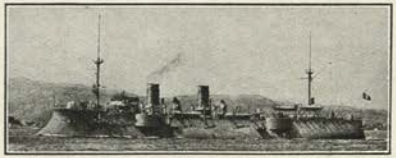


DESCARTES (1894). Displacement, *about* 4000 tons. Complement, 378. Guns: 4—6·4 inch, 45 cal., 10—4 inch, 10—3 pdr., 4—1 pdr. Torpedo tubes: 2—18 inch, *above water*. Armour: 2″ Deck, 2″ Casemates to 6·4 guns on main deck. Designed H.P. 8500=19·5 kts. Coal: *maximum* 750 tons. Boilers: Bellevilles (*without* economisers).

Subsidiary Service Cruisers.

(*Note.*—One or both now have pole masts.)

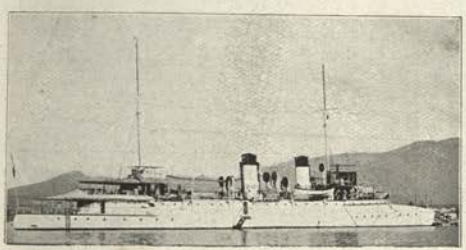
LATOUCHE-TRÉVILLE (1892) & **BRUIX** (1894). 4750 tons. Complement, 370. Armament (M. '87): 2—7·6 inch, 6—5·5 inch, 6—9 pdr., 4—3 pdr. 4—18 inch tubes *above water*. Armour: 3⅞″ Belt and 4″ Turrets (steel). Designed H.P. 8300=18·5 kts. Coal: *maximum* 600 tons. Boilers: Belleville (*without* economisers).



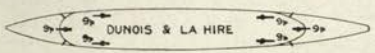
LAVOISIER (1897). 2,350 tons. Complement 248. Armament (M. '91): 4—5·5 inch, 45 cal., 2—4 inch, 8—3 pdr. 2 tubes *above water*. Armour: 1½″ Deck, 2″ Main deck sponsons. Designed H.P. 7,000=20 knots. Coal: *maximum* 380 tons. Boilers: Belleville.

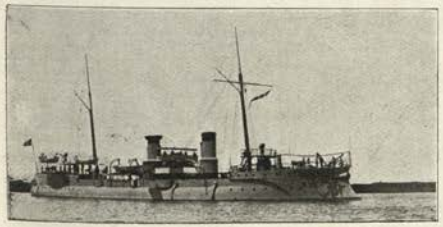
FRIANT (1893). 3882 tons. Armament, etc., as *Du Chayla*, except coal, *maximum* 587 tons.

Torpedo Gunboats.



DUNOIS (1897) & **LA HIRE** (1898). Displacement, 900 tons. Complement, 128. Length, 256 feet. Beam, 28 feet. *Maximum* draught, 12¾ feet. Guns: 6—9 pdr., 6—3 pdr. No tubes. Designed H.P. 6400=23 kts. (never made). Coal: *maximum* 160 tons. Boilers: Normand.



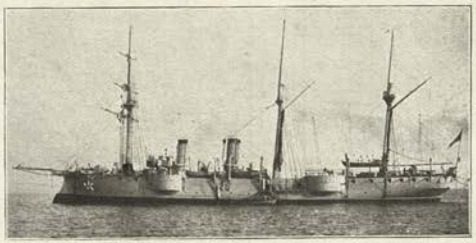


D'IBERVILLE (1892). Displacement, 925 tons. Complement, 140. Length, 262¼ feet. Beam, 26½ feet. *Maximum* draught, 11¾ feet. Guns: 1—4 inch (bow), 3—9 pdr., 6—3 pdr. Designed H.P. 5000=21·5 kts. Coal: *maximum* 135 tons. Cylindrical boilers.

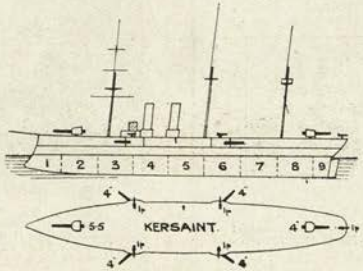
"Avisos."

Building.

N (*building*). 600 tons. Complement 45. Guns: 1—1 pdr.

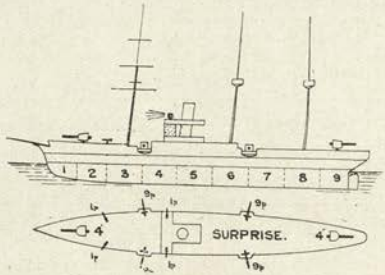


KERSAINT (1897). 1243 tons. Guns: 1—5·5 inch, 5—4 inch, 7 small. No torpedoes. Designed H.P. 2,200=15 kts. Coal: 200 tons.



Gunboats.

SURPRISE (1896), **DÉCIDÉE** (1899), **ZÉLÉE** (1900). 680 tons. Armament: 2—4 inch, 4—9 pdr., 4—1 pdr. No torpedoes. Complement, 93. Designed H.P. 900=13·4 kts. 2 screws. Coal: 73 tons. *Décidée* and *Zélée* have Niclausse boilers.



River Gunboats.

ARGUS & **VIGILANTE** (1900). 123 tons. Speed, 13 kts. Guns: 2—3·5 inch, 4—1 pdr. (In China.)

DOUDART DE LAGRÉE (1909), & *BALNY* (1914.) 213 tons. Speed, 14·5 kts. Guns: 6—1 pdr. (in China). Fouché w.t. boilers.

81 + 3 Destroyers.

Totals.	Class.	First Begun	Last Completed.	*Normal* Displacement. tons.	I.H.P.	*Max.* Speed. kts.	*Max.* Coal. tons.	Complement.	*Max.* Draught. feet.
3		1912	1914		...	...	...	...	...
6	*Bisson*	1911	1913		14300	30	140	87	10
2	*Henry*	1909	1913	450	8600	28	80	80	...
12	*Bouclier*	1908	1912	714	14000	31	120 (oil)	80	$10\frac{3}{4}$
5		1907	1910						
3	*Spahi*	1906	1909	428	7200	28	80	80	$9\frac{3}{4}$
3		1906	1909						
2	*Branlebas*	1906	1908	328	6800	25	80	62	10
6	*Gabion*	1905	1907	335	6800	28	75	62	$10\frac{1}{2}$
13	*Coutelas*	1903	1906						
14	*Arc*	1902	1904	303	6300	28	75	62	$10\frac{1}{2}$
9	*Arbélète*	1900	1902						
3	*Yatagan*	1900	1902	310	6300	26	75	62	10
3	*Durandal*	1899	1901	310	5000	28	84	62	10

Bisson class.

Note.—The *Bisson* class all carry 2—4 inch, 4—9 pdr., 4—18 inch tubes in pairs. Nominal radius 1170 at 14 kts., 2300 at 10 kts.

Completing.

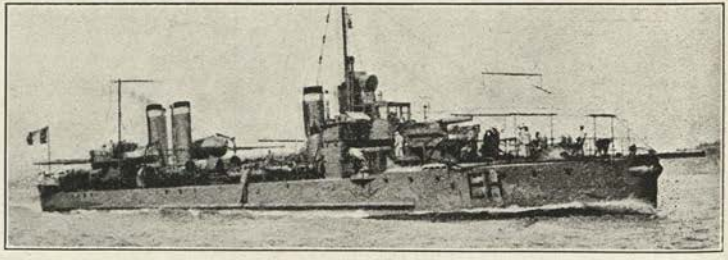
Dockyard built (at Rochefort). ***Protet*** (1913) *(at Toulon).* ***Commandant Lucas*** (1912). 791 tons. Dimensions: $257\frac{1}{2} \times 25\frac{1}{2} \times 9\frac{1}{2}$ feet. Designed H.P. 15,000 = 30 kts. Also *(at Toulon)*, ***Bisson*** (1912) and ***Renaudin*** (1913). 756 tons. Dimensions: $256 \times 26 \times 9\frac{1}{2}$ feet. Designed H.P. 14,300 = 30 kts. Trials: *Renaudin* 32·2 kts.
The three later boats are ***Enseigne Roux, Mech. Prin. Lestin,*** and ***N.*** 830 tons.

Completing.

1 *Ch. de Bretagne (Nantes).* ***Magon*** (1913), 791 tons. Dimensions: $257\frac{1}{2} \times 25\frac{1}{2} \times 9\frac{1}{2}$ feet. Designed H.P. 15,000 = 30 kts. Rateau turbines.

Completing.

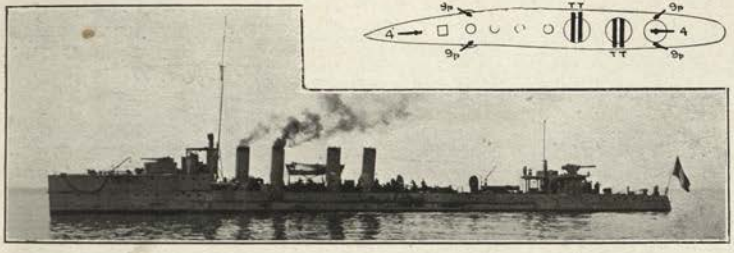
1 *Schneider & Cie (Creusot).* ***Mangini*** (1913), 791 tons. Dimensions: $257\frac{1}{2} \times 25\frac{1}{2} \times 9\frac{1}{2}$ feet. Designed H.P. 15,000 = 30 kts. Zoelly turbines. Du Temple-Guyot boilers.



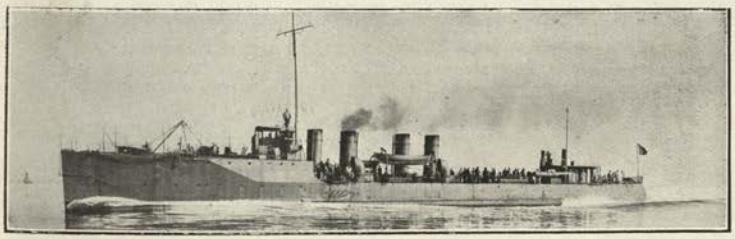
2 *Henry* class:—***Enseigne Henry, Aspirant Herbert*** *(Rochefort).* Armament: 6—9 pdr., 3—18 inch tubes. Nominal radius 1170 at 14 kts. Dimensions: $216 \times 21\frac{1}{2} \times 7\frac{1}{2}$ feet. 3 screws. Designed H.P. 8600 = 28 kts. Trials: *E. Henry* 28·3 kts., *A. Herbert* 28·5 kts.
Note.—These boats have *four* funnels in pairs, the foremost funnel being close up against the chart house.

1910 type FRENCH DESTROYERS.

Note.—All these boats have armament: 2—4 inch, 4—9 pdr., 4—18 inch tubes (in pairs). *Nominal* radius of all: 1170 at 14 kts., or 2300 at 10 kts. Oil fuel only, 120 tons. All have the same deck plan, but they differ according to builders in appearance, dimensions, horse power, turbines, &c.



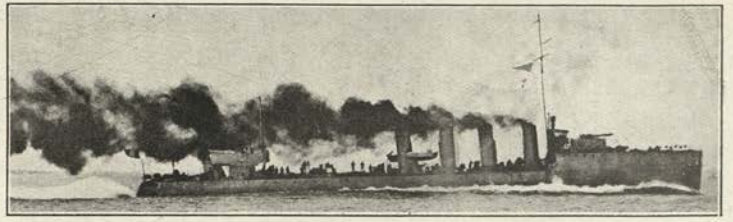
2 *Ch. de la Bretagne (Nantes).* ***Fourché*** (1910), and ***Faulx*** (1911). 734 tons. Dimensions: 246×25×9½ feet. Designed H.P. 12,250=31 kts. Rateau turbines. Du T-Guyot boilers. Trials: *Fourché*, 33·8; *Faulx*, 32·2.



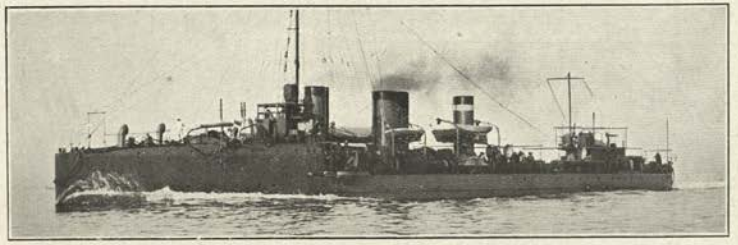
2 *Ch. de la Gironde (Bordeaux).* ***Cimeterre*** (1910), ***Dague*** (1911). 720 tons. Dimensions: 256×26×9½ feet. Designed H.P. 13,315=31 kts. Breguet turbines. Du Temple Guyot boilers. Trials: *Cimeterre*, 32·75; *Dague*, 33·2.

Same appearance as above.

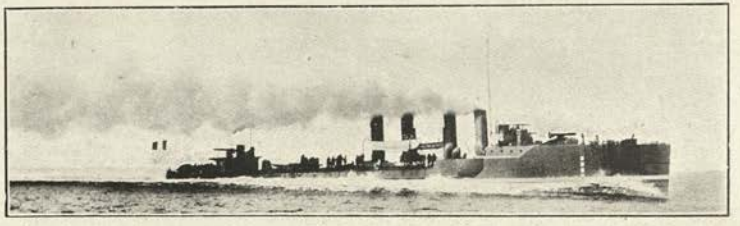
2 *Ch. de St. Nazaire (St. Nazaire).* ***Dehorter*** (1911), ***Mehl*** (1911). 756 tons. Dimensions: 256×25½×10 feet. Designed H.P. 13,810=31 kts. Turbines: Parsons Boilers: Normand.



3 *Dyle & Bacalan (Bordeaux).* ***Boutefeu*** (1911). 703 tons. Dimensions: 252½×25×9½ feet. Designed H.P. 13,810=31 kts. Turbines: Zoelly (Schneider). Boilers: Du Temple-Guyot. *Also* ***Riviere*** (1911), ***Bory*** (1911). 746 tons. Dimensions: 252½×26×9½ feet. Designed H.P. 14,300=31 kts. Trials: *Riviere* 32·27 kts.



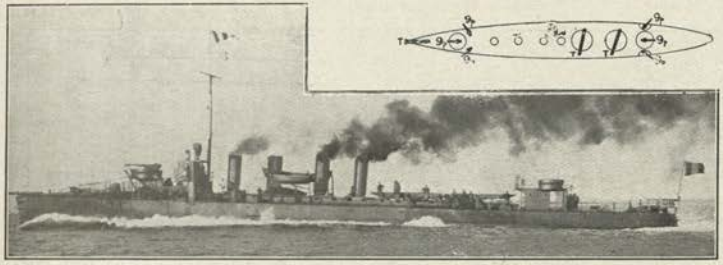
1 *Forges et Ch. de la Mediterranée (La Seyne).* ***Casque*** (1910). 732 tons. Dimensions: 252½×25×10 feet. Designed H.P. 14,000=32 kts. Parsons turbines. Normand boilers. Trials: 14,205=35·6 kts.



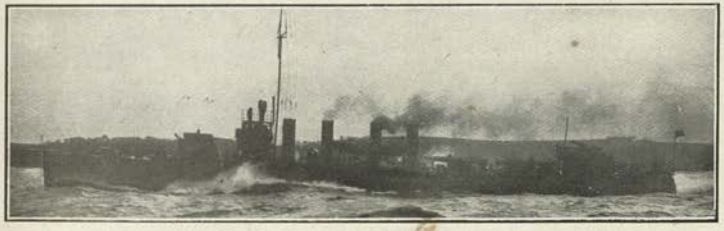
2 *Normand (Harre).* ***Bouclier*** (1910). 692 tons. Dimensions: 233×25×10 feet. Designed H.P. 12,000=32 kts. *Also* ***Garnier*** (1911). 732 tons. Dimensions: 246×25½×10½ feet. Designed H.P. 13,810=31 kts. Turbines: Parsons. Boilers: Normand. Trials: *Bouclier*, 12,825=35·4; *Garnier*.

1906 design. FRENCH DESTROYERS.—*Spahi* class.

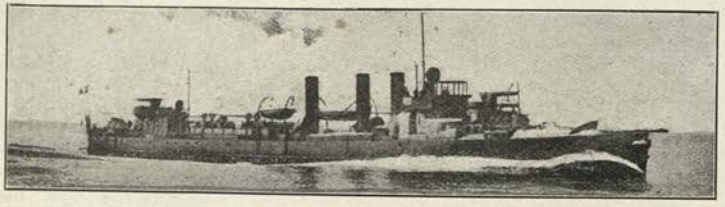
Note.—These boats have all an armament of 6—9 pdr. and 3—18 inch tubes, of which one is in the bow. All have a maximum nominal radius of 1700 at 14 and 2300 at 10 kts. The fuel carried by all is *maximum* capacity 100 tons; the *normal* varies. The boats differ considerably in appearance, there is also variety in their deck plans, dimensions, machinery, etc., according to the builders. All are designed for H.P. 7200 = 28 kts.



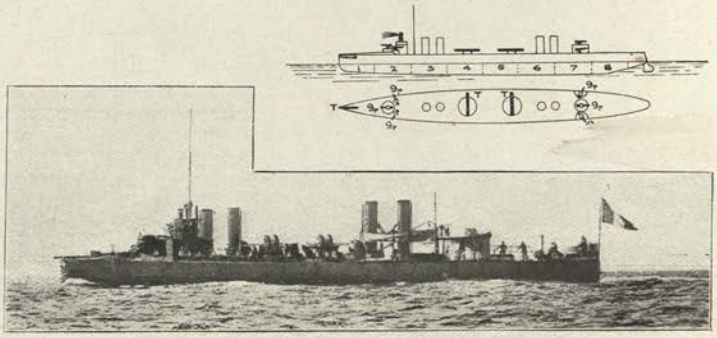
4 *Ch. de la Bretagne (Nantes).* ***Voltigeur*** (1908), ***Chasseur*** (1909), ***Fantassin*** (1909), ***Cavalier*** (1910). About 450 tons. Dimensions: 216½×21½×9½ feet. Turbines: *Voltigeur*, Rateau with reciprocating; *Chasseur*, *Fantassin*, *Cavalier*, Parsons. Boilers: Normand. Trials: *Voltigeur*, 31·6; *Chasseur*, 30·4; *Fantassin*, 30·4; *Cavalier*, 31·1.



1 *Ch. de la Gironde (Bordeaux).* ***Tirailleur*** (1908), 420 tons. Dimensions: 207×21½×9½ feet. Rateau turbines and reciprocating engines. Du Temple-Guyot boilers. *Tirailleur*, 28·82.



1 *Ch. de la Loire (S. Nazaire).* ***Janissiere*** (1910), 449 tons. Dimensions: 213×21½×9½ feet. Parsons turbines. White-Forster boilers. On trial made 28·5 kts.

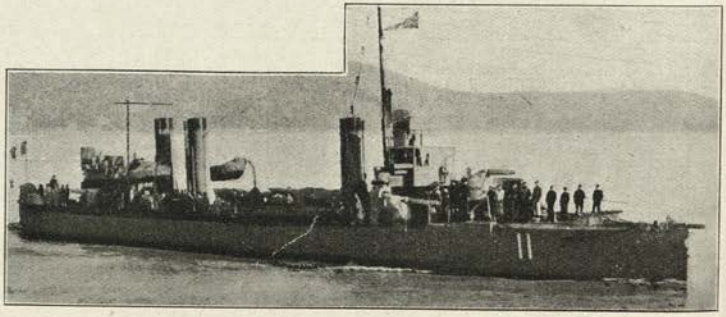


1 *Ch. de la Loire (Nantes).* ***Hussard*** (1908), ***Mameluk*** (1909), 403 tons. Dimensions: 216½×21½×9½ feet. *Normal* coal 37 tons.

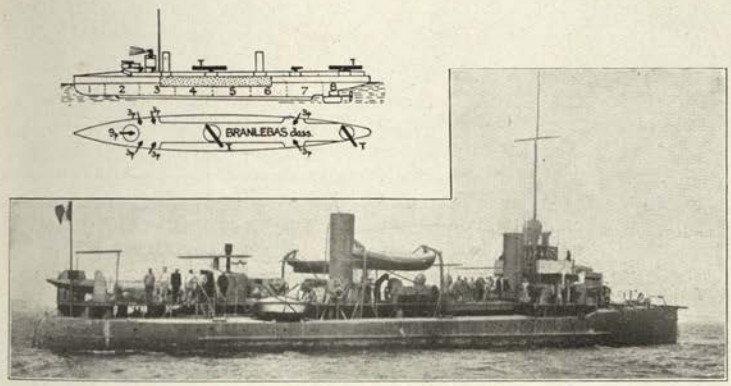
1 *Normand (Havre).* ***Spahi*** (1908), 421 tons. Dimensions: 213×21½×9½ feet. *Normal* coal 38 tons.

1 (?) ***Carabinier*** (1908), 409 tons. Dimensions: 210×21×9½ feet. *Normal* coal 30 tons.

Machinery of all, reciprocating. Boilers: *Spahi*, Normand; others, Du Temple-Guyot. Trials: *Hussard*, 30·4; *Mameluk*, 30·6; *Spahi*, 28·7; *Carabinier*, 27·5.

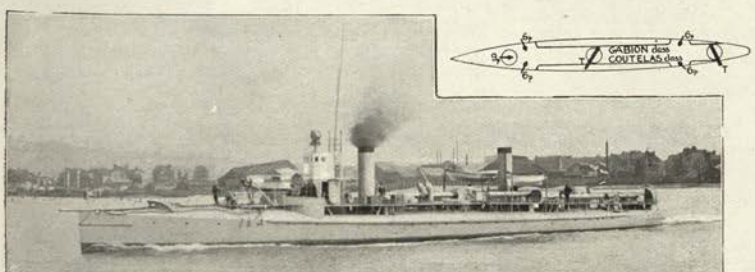


1 *Dyle & Bacalan (Bordeaux).* ***Lansquenet*** (1909), 417 tons. Dimensions: 210×21½×9½ feet. Machinery reciprocating. *Normal* coal, 37 tons.



Photo, Bissonier.

2 *Branlebas* class. ***Branlebas, Fanfare.*** These are armoured. 1" belts amidships. Armament: 1—9 pdr., 6—3 pdr., 2—18 in. tubes (M '04 torpedoes). Boilers: Guyot. *Maximum* radius: 2300 miles at 10 kts.

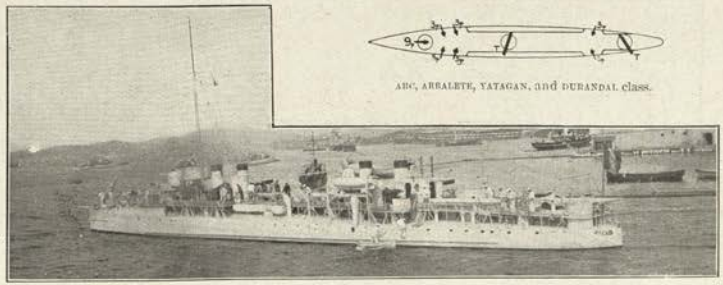


6 *Gabion* class. ***Etandard, Fanion, Gabion, Oriflamme, Sape, Sabretache.***

13 *Coutelas* class. ***Cognee, Coutelas, Carquois, Claymore, Fleuret, Glaive, Mortier, Obusier, Pierrier, Poignard, Stylet, Tromblon, Trident.***
Armament: 1—9 pdr., 4—6 pdr., 2—18 in. tubes. Normand boilers. *Maximum* radius, 2300 at 10 kts.

13 *Arc* class. ***Arc, Belier, Bombarde, Catapulte, Dard, Francisque, Fronde, Harpon, Mousqueton, Pistolet, Sabre, Javeline, Mousquet.***

(*Hache*, *Massue*, and *Baliste* of above type are now mine layers).



3 *Yatagan* class. ***Épée, Pique, Yatagan*** (4 funnels).
Armament: 1—9 pdr., 6—3 pdr., 2—15 in. tubes. Normand boilers. *Max.* radius, 2000 at 10 kts.

9 *Arbalète* class. ***Arbalète, Arquebuse, Carabine, Escopette, Epieu, Pertuisane, Rapiere, Sagaie, Sarabacane.***

(*Flamberge* of this class converted into a mine layer.

3 *Durandal* class. ***Durandal, Fauconneau, Hallebarde.***

Armament: 1—9 pdr., 6—3 pdr., 2—15 in. tubes. Normand boilers. *Max.* radius, 2000 at 10 kts.

17 Torpilleurs de haute mer.

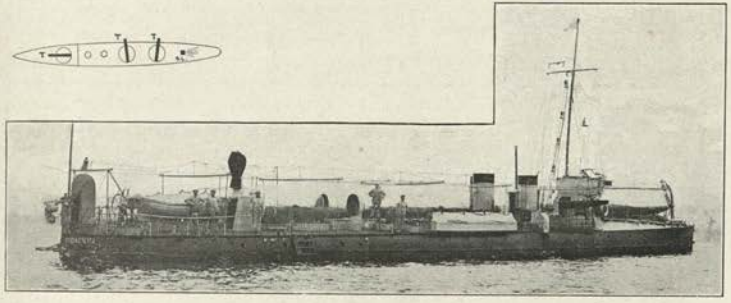
2 screws. 15 inch torpedoes.

All armed with 2—3 pdr. Boilers: Normand, Thornycroft, and Du Temple Guyot.

Totals.	Type.	Date.	Displacement.	I.H.P.	*Max.* Speed.	Coal.	Complement.	Tubes.	*Max.* Draught.
					kts.	tons.			feet.
6	*Audacieux*	1900-1	185	1200	26	25	18	3	9
5	*Borrée*	1900	162	4400	30	18	30	2	8
1	*Forban*	1895	140	3200	31·2	15	28	2	$7\frac{1}{2}$
1	*Chevalier*	1893	134	2700	27·2	17	32	2	7
1	*Grenadier*	'92-'93	129	1400	25·21	$15\frac{1}{2}$	26	2	$8\frac{1}{2}$
2	*Aquilon*	'93-'99	120	2000	26·17	16	34	2	$9\frac{1}{2}$
1	*Grondeur*	1890	133	1750	24	20	27	2	5

(The *Forban* and *Borrée* (Normand type) all considerably exceeded 30 knots on *trial*).

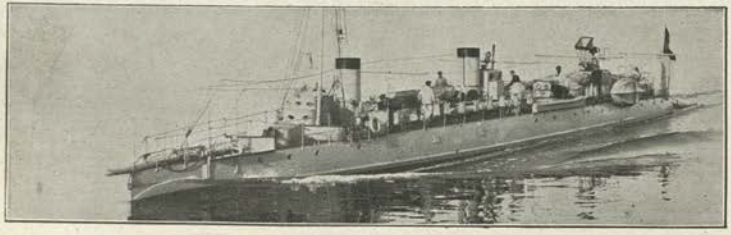
Only the first 12 or so are really on the active list. The older boats only do duty as fishery cruisers.



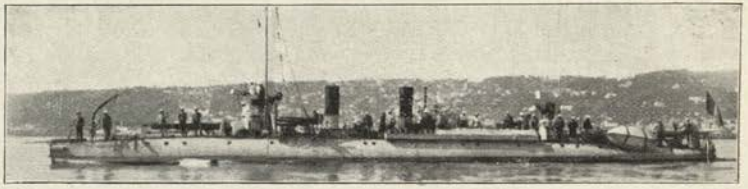
Photo, Bissonier.

6 *Audacieux* type are armoured with 4" steel amidships. Named ***Audacieux, Mistral, Simoun, Sirocco Trombe, Typhon.*** 1" deck over engines and boilers.

5 *Borrée* type, ***Tramontane, Borrée, Bourrasque, Cyclone, Rafale.***

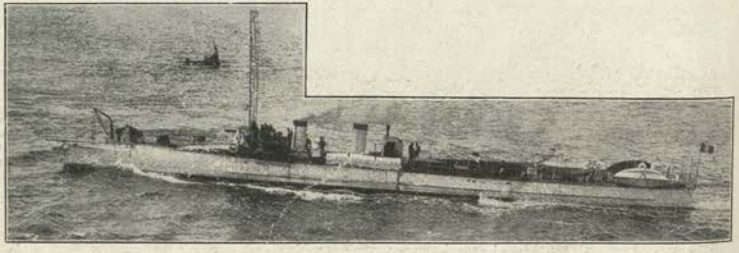


Forban. (Radius: 2000 miles at 12 kts.) Also ***Chevalier.***



Grenadier.

2 *Argonauté* type, ***Aquilon, Filibustier.***



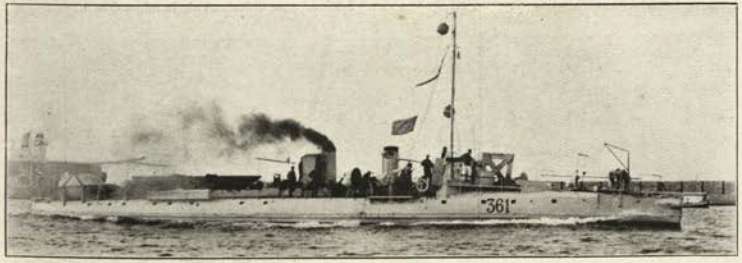
Grondeur.

170 Torpilleurs de Defence Mobile (Armed with 2—1 pdrs. and 14 inch torpedoes up to No. 302. Later boats 18 inch torpedoes).

Totals	Numbers	First Begun	Last Completed	Displacement	I.H.P.	*Max.* Speed	Coal	Complement	Tubes	*Max.* Draught
				tons		kts.	tons			
75	369—295	'03	'09	97½	2000	26	...	23	3	10
1	243	'03	'05	90	1500 *t*	25	10	23	3	10
94	292—202	1899	1905	87	1500	25	10	21	2	9
	200—149	1894	1899	80	1100	21	10	16	2	9

Nos. 294, 293 and 243 turbines. Of the above boats there have been lost or struck off the list:—Nos. 243, 150, 152, 154, 155—161, 163—169, 172—174, 176, 177—179, 182, 186, 189, 190, 194, 198, 199, 201, 203—205, 207—209, 210, 215, 223, 234, 263, 293, 294; also 166, 180, 152, 271, 290.

Only the first 76 scheduled can be deemed really effective.



75—97½ and 90 ton boats. Nos. ***369–295.*** *Nominal* full speed radius 200 miles. At 10 kts., 1800 miles. *Also* ***292–201.***

87—87 ton boats. Nos. ***200–149.*** Some of these have been re-boilered and given two funnels, appearance more or less as above.

67 + 9 Submersibles & Sousmarins.

No. in Class.	Type.	First begun.	Last Completed.	Displacement. tons. Surface.	Surface. H.P.	*Max.* Speed above and below. kts.	*Max.* Surface Radius. miles.	Tubes or Gear.	Complement.
2	*Diane*	'13	'15	630	1800	18·5	...	8	35
7	*G. Zédé* type	'14	'16	740	4400	20—	2300	8	40
3	*Bellone*	'12	'14	520	1800	17·5—	...	8	29
8	*Clorinde* type (C)	'12	'14	410	1300	15—9½	1400	8	27
2	*G. Zédé*	'11	'14	740	4800	18—12	2300	8	40
2	*Clorinde* (C)	'10	'13	410	1300	15—9½	1400	8	27
14	*Cherbourg* (L)	'07	'12	400	800	12—9	1400	7	24
10	*Rochefort* (L)							7	24
9	*Toulon* (L)							6	24
1	*Am. Bourgeois* (Bo)	'07	'12	555	1560	15—10	2000	7	25
1	*Mariotte* (R)	'07	'11	530	1440	15—10	...	6	28
1	*Archiméde* (H)	'07	'10	577	1700	15—10	2000	7	26
2	*Circe* (L)	'04	'08	351	460	11—8	1000	6	25
1	*Argonaute* (B)*	'04	'08	301	200	11—8	600	4	20
6	*Emeraude* (M)*	'03	'08	390	600	12—8	1000	6	21
2	*Aigrette* (L)	'03	'05	172	200	10½—8	600	4	20
1	*Follet* (M)*	'99	'02	185	300	12—8	140	4	16
4	*Triton* (L)	'98	'03	106	215	12—8	500	4	12

(B)=Bertin. (Bo)=Bourdelle. (C)=Caverley. (H)=Hutter. (L)=Laubeuf. (M)=Maugas. (R)=Radiguet. (S)=Simonot.
*=Officially called *Sousmarins* and intended for coast defence. The others are called *Submersibles* and regarded as sea-going.

Building.

7 *Improved Zédés*: ***Fulton, Joessel, Laplace, Lagrange, Regnault*** (laid down 1914). Also ***Sané, Dupuy de Lôme*** (1914). $\frac{830}{1070}$ tons. Complement 40. Dimensions: 246×21×13 feet. H.P. $\frac{4400}{1700} = \frac{19}{11}$ kts. Steam on surface. Armament: 8 tubes. 4—9 pdr. guns.

Building.

2 ***Diane, Daphne*** (1914) $\frac{630}{?}$ tons. Dimensions: 223×18½×12½ feet. Complement 35. H.P. $\frac{1800}{?} = \frac{18·5}{9·5}$ kts. Diesel motors. Armament: 10 tubes. 4—9 pdr. guns.

Building.

3 *Bellone* class: ***Bellone, Hermione, Gorgone*** (1914). $\frac{520}{610}$ tons. Complement 29. H.P. $\frac{1800}{?} = \frac{17·5}{?}$ kts. Diesel motors. Armament: 8—18 inch tubes.

Building and Completing.

10 *Clorinde* type: ***Amphitrite, Astrée, Arthemis, Aréthuse, Atalante, Amarante, Ariane, Andromaque*** (all 1914). ***Clorinde*** (1913), ***Cornélie*** (1913). $\frac{410}{550}$ tons. Complement 27. Dimensions: 177 × 16¼ × 10¼ feet. H.P. $\frac{1300}{?} = \frac{15}{9·5}$ kts. Diesel motors. Armament: 8—18 inch tubes. Nominal radius about 1500 at 10 kts.

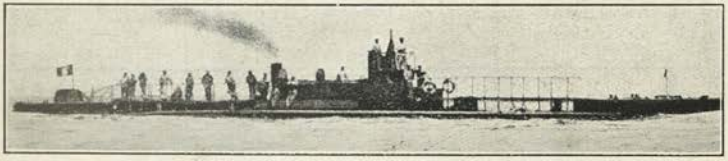
Completing.

2 ***Gustave-Zédé, Néréide.*** $\frac{740}{1000}$ tons. Dimensions: 239¼ × 19¼ × 15 feet. *Nominal* radius (surface): 2300 at 10 kts.; 1700 at 14 kts.

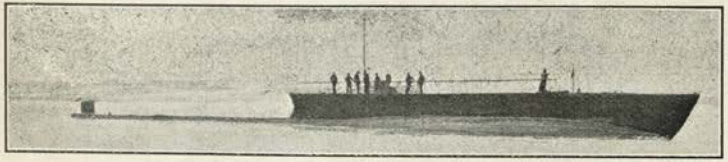
4 Experimental Boats.

Building.

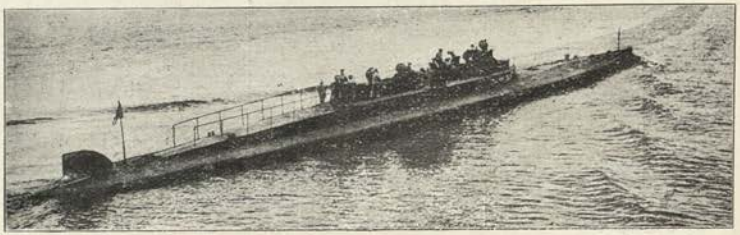
1 *Bourdelle* type: ***Amiral Bourgois.*** $\frac{555}{735}$ tons. Dimensions: 184 × 26¼ × 12 feet. Oil surface motor, 1560 h.p. = 15 kts. 7—18 inch tubes (m. 1904).



1 *Maurice* type: ***Charles Brun.*** $\frac{355}{450}$ tons. Dimensions: 144¼ × 16¼ × 12 feet. Surface motor, steam, 1300 = 15·8 kts. 6—18 inch tubes (1904 model).



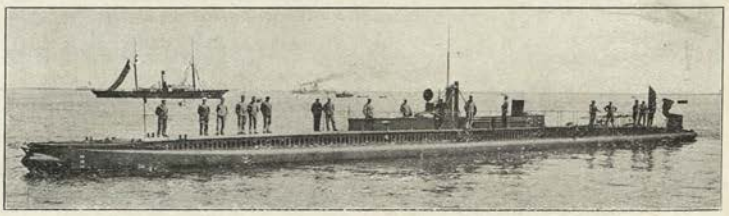
1 *Radiguet* type: ***Mariotte.*** $\frac{530}{630}$ tons. Dimensions: 213 × 14 × 12½ feet. Petrol surface motor, 1440 = 15 kts. 7—18 inch tubes (1904 m.).



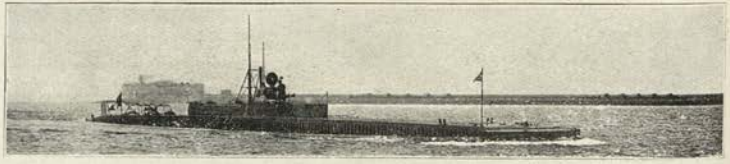
Huetter type: ***Archimede.*** $\frac{577}{810}$ tons. Dimensions: 212 × 22¼ × 20 feet. Surface motor, steam, = 15 kts. Fitted with 3 horizontal and 1 vertical rudder. Surface radius, 2000 miles at 10 kts. Submerged, 100 at 5 kts. 7—18 inch tubes (m. 1904).

33 Laubeuf Boats.

(The 33 boats in this group are all of one general *Laubeuf* type, differing only in minor details.)



14 *Cherbourgh Laubeufs*: ***Brumaire, Floreal, Frimaire, Fructidor, Germinal, Messidor, Nivose, Pluviôse, Prairial, Thermidor, Ventose.*** Also ***Euler, Foucault, Franklin*** (of which all except *Brumaire*, *Frimaire*, and *Nivôse* (petrol), are steam driven on the surface. *(see below.)*



10 *Rochefort Laubeufs*: ***Berthelot, Cugnot, Faraday, Fresnel, Giffard, Montgolfier, Newton, Papin, Volta, Watt*** (of which *Cugnot*, *Giffard*, and *Watt* are steam, all the rest oil motors.) *(see next page.)*

9 *Toulon Laubeufs:* ***Ampere, Arago, Bernouilli, Colomb, Curie, Gay-Lussac, Joule, Leverrier, Monge*** (of which all are oil motors on surface).

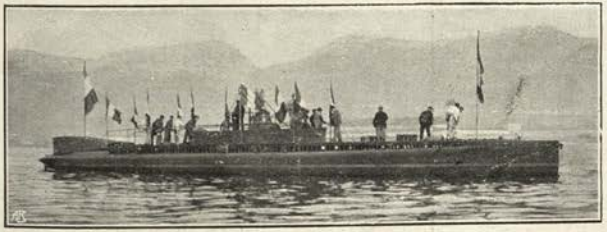
The whole of the above 38 boats are of $\frac{398}{330}$ tons. Dimensions: 168×16½×10 feet. H.P., 700=12 kts. surface speed, with maximum radius 2000 miles. Submerged speed, 7¾ kts. Torpedoes, 7—18 inch (m. 1901), except in Toulon boats (6 only).

12 boats, various.

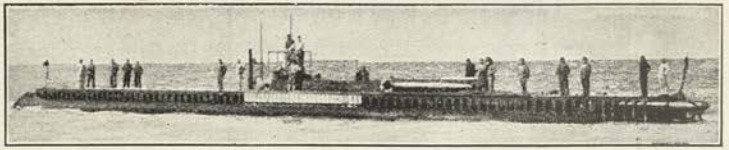
Early small edition of Brumaire, etc.

2 *Laubeuf:* ***Circe, Calypso.*** $\frac{391}{450}$ tons. Dimensions: 154×16½×10 feet. 6—18 inch torpedoes.

6 *Mangas-Emeraude* class, named ***Émeraude, Opale, Rubis, Saphir, Turquoise,*** and ***Topaze.*** There is a vertical petrol motor. 2 screws. Dimensions: 147×13×12 feet.

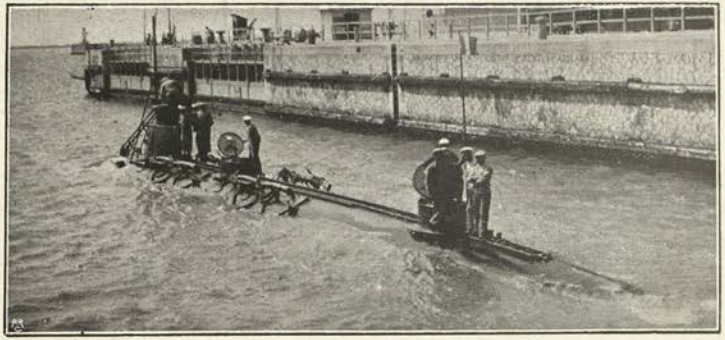


2 *Laubeuf:* ***Aigrette*** and ***Cignone.*** $\frac{172}{351}$ tons. Enlarged *Tritons.* Dimensions: 118×13×13 feet. 4—18 torpedo launching tubes. H.P. 200=10·5 kts. Maximum surface radius, 600 miles at 8 kts



1 *Bertin:* ***Argonaute*** *(ex Omega).* $\frac{168}{301}$ tons. Dimensions: 154½×14×9½ feet. Surface motor Diesel. H.P., 2?0=11 kts. Submerged speed, 8 kts.

5 boats, various.

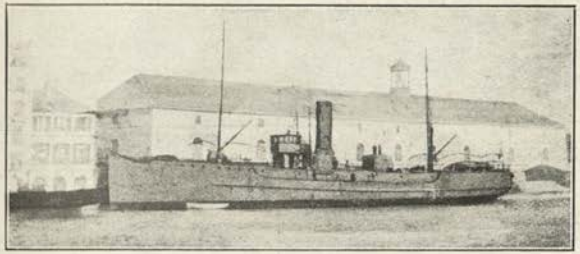


1 *Mangas:* ***Follet*** *(ex Farfadet).* $\frac{185}{200}$ tons. Dimensions: 135×10×10 feet. Electric power only. Speed above, 12 kts., submerged, 8 kts. Nominal radius, 50 above, 30 below. 4—18 inch torpedoes (old type launching gear).

4 *Laubeuf:* ***Triton, Silure, Espadon, Sirene.*** $\frac{106}{200}$ tons. Dimensions: 111½×12½×13 feet. Steam on surface H.P., 250=11 kts. or so. *Maximum* surface radius, 600 at 8 kts. Armament, 4—18 inch launching gears.

Surface motor is a triple expansion steam engine, fired with heavy petroleum. Flash boiler, Fulmen accumulators. Can nominally do 70 miles submerged at 5 kts. but cannot really keep under so long. Boats built like torpedo boats with a double skin and submerged by the admission of water into the space between the skins.

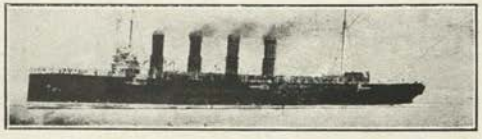
Mine Layers.



PLUTON (1911) & **CERBERE** (1911). 566 tons. No guns. Designed H.P. 6000 = 20 kts. Carry 60 mines. Builder, Normand.

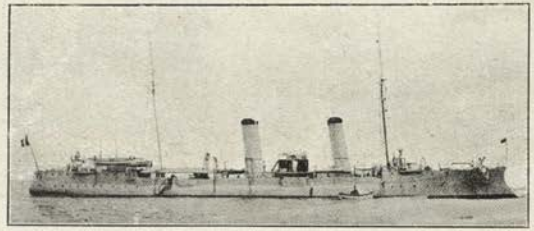
See page 279.
Destroyers converted to mine layers, 2 funnels, except *Flamberge*, which has 4.

HACHE (1906), **MASSUE** (1906), **BALISTE** (1904), **FLAMBERGE** (1901).



CHATEAURENAULT (1898) 8018 tons. Dimensions: 457 × 56 × 22½ feet. Armament: 2—6·4, 6—5·5, 10—3 pdr. Armour: 3″ deck. Designed H.P. 23,000 = 23 kts. Boilers: Normand-Sigaudy. Coal. *maximum* 2100 tons. Made 24·5 kts. on first trials.

Mine Layers—*continued.*

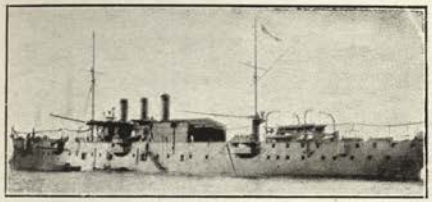


CASABIANCA (1895), & **CASSINI** (1894). 960 tons. Dimensions: 269 × 27½ × 12 feet. Armament: 1—4 inch, 3—9 pdr., 7—3 pdr. Double skin and deck amidships. Designed H.P. 5200 = 21·5 kts. (just made on first trials). Boilers: D'Allest. Coal: *maximum* 135 tons.

Submarine Depot Ship.

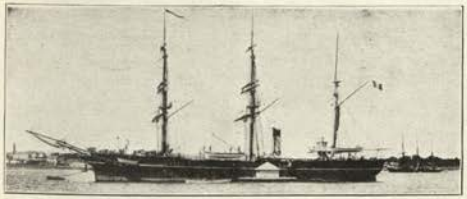
TREHOUART (1893). 6535 tons. Dimensions *about* 293 × 58½ × 24½ feet. Armament (M '87): 2 – 12 inch, 45 cal. (specially fitted for high angle fire), 8—4 inch, 4—3 pdr., 10—1 pdr., 2—18 inch tubes *above water*. Armour: 17¾″ belt, 14½″ turrets. Designed H.P. 8400 = 17 kts. Boilers: Belleville (without economisers). Coal: *maximum* 337 tons.

Special Aerial Depot Ship.



FOUDRE (October, 1895). Displacement 6,086 tons. Complement 410. Length, 374½ feet. Beam, 51¾ feet. *Maximum* draught, 25 feet. Guns: 8—4 in., 4—9 pdr., 2—3 pdr. Armour: Deck 3½", 4" casemates. Designed H.P. 11,400 = 19·9 kts. *Trials* (1897): I.H.P. 11,930 = 19·57 kts. *General Notes*—Also fitted to carry submarines and a balloon. Floating workship. Laid down at Bordeaux, 1892. Completed 1897. Cost about £410,000. 1912—Fitting to carry flying machines.

Avisos Transports.



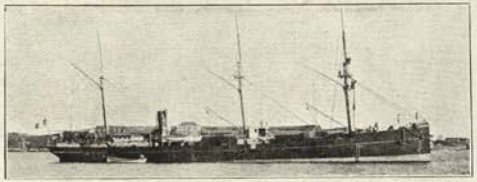
Photo, N. D.

MANCHE (1890), **VAUCLUSE** (1901). About 1600 tons. Armament. *Nil.* Speed about 10-11 kts. (*Surveying Vessels*).

Transport.

VINH-LONG (1881). 5,500 tons. Guns: 4—5·5 inch, 2—4 inch, 2—9 pdr., 2—3 pdr. Speed: *nominal* 13 kts. Draughts, about 22 feet.

Transport.



Photo, N.D.

DROME (1887). 2200 tons. 2 small guns. Speed, 11 kts.

Special Service.

CHAMOIS (1906). 425 tons. Guns: 4—3 pdr. Designed H.P. 740 = 15 kts. Boilers: Du Temple. (*Pilotage School*).

IBIS (1883). 254 tons. Draught, 8 feet. Guns: 2—9 pdrs. H.P. 424 = 12 kts. 1 screw. (*Coastguard Service.*)

ITALIAN FLEET.

(Officially revised, 1914, by order of the Minister of Marine.)

Chief Torpedo Stations.

Genoa, Spezia, Maddalena, Gaeta, Messina, Taranto, Brindisi, Ancona, Venice.

Principal Mercantile Ports.

Genoa (*Genova*), Naples (*Napoli*), Leghorn (*Livorno*), Palermo, Venice (*Venezia*), Catania (*Sicily*).

MADDALENA

to	knots.
Ajaccio ...	60
Bonafacio ...	20
Naples ...	310

SPEZIA

to	knots.
Ajaccio ...	160
Bizerta ...	430
Genoa ...	50
Leghorn ...	40
Maddalena ...	175
Malta ...	580
Naples ...	290
Taranto ...	630
Toulon ...	195
Venice ...	1000

NAPLES

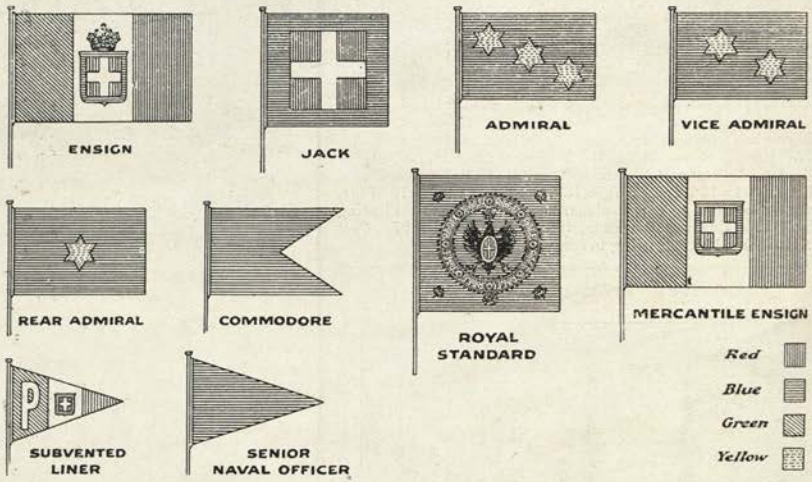
to	knots.
Ajaccio ...	265
Bizerta ...	315
Bonafacio ...	225
Maddalena ...	210

VENICE

to	knots.
Pola ...	75
Taranto ...	575
Toulon ...	1197

TARANTO

to	knots.
Bizerta ...	550
Malta ...	310
Messina ...	220
Naples ...	380
Venice ...	575



Private Yards.

(All do Government work).

1. ANSALDO (Genoa and Sestri Ponente).
   At Genoa there is a dock able to take any warship, and three able to take smaller cruisers (*Garibaldi* type).
2. ORLANDO (Leghorn).
   At Leghorn there is a dock 443 × 65 × 23¼ feet.
3. PATTISON (Naples). Total employees . Destroyers built here.
4. ODERO (Sestri Ponente, near Genoa). Total employees . Cruisers built. Can build battleships at Foce, Genoa.

Largest dock (Genoa) is 561 × 81 × 30½.

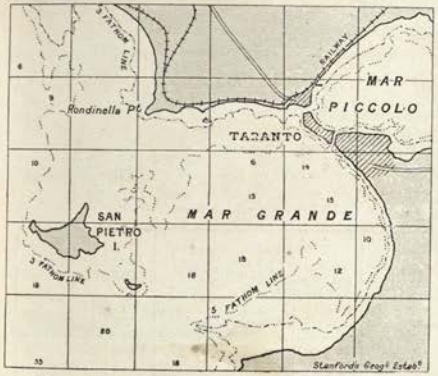
Mercantile Marine (1,108,000 tons).

757 steamers (274 over 2,000 tons, 145 of 2,000-1,000 tons, and 290 under 100 tons).
4,145 sailing (216 over 1,000 tons, but 4,145 under 50 tons).

Coinage.

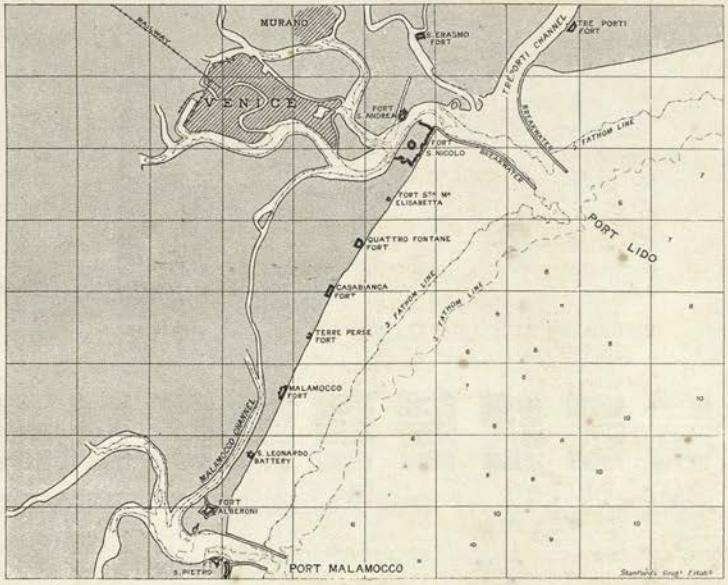
Lira (100 centesimi) = 10*d.* British, about 20 cents U.S.A. Value varies.

ITALIAN DOCKYARDS. In 2000 yard squares. Uniform scale. Soundings in fathoms. Heights in feet.

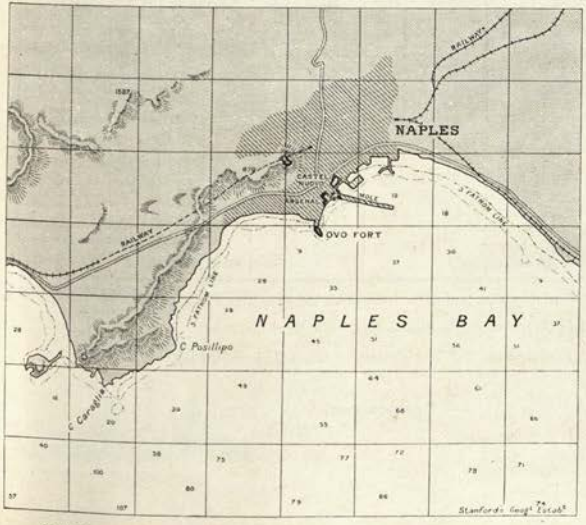


TARANTO.

SPEZIA.



VENICE.



NAPLES.

Royal Dockyards.

SPEZIA. One dock able to take any warship in the world ($687 \times 105\frac{1}{2} \times 33$); one nearly able to ($508 \times 90 \times 33$ feet); two able to take any Italian warship ($430 \times 77 \times 30$ feet); two smaller ($358 \times 71 \times 30$ feet). Two large slips. Total employees about 5300. Admiralty Chart No. 155.

NAPLES (NAPOLI). One small dock, $247 \times 62 \times 19\frac{1}{2}$ feet. One small slip. Total employees 3029. Good anchorage. Commercial harbour. Admiralty Chart No. 1728. There is a municipal dock at Naples, $364 \times 54 \times 24$ feet, and another, to be completed 1909, able to take any warship.

CASTELLAMARE. No docks. Building yard. Two large slips, two small. Total employees 1,920.

TARANTO. One dock able to take any warship in the world ($691 \times 94\frac{1}{2} \times 32\frac{1}{2}$). One large slip. Total employees 1561. Admiralty Chart No. 1643. Two 130 ton old Krupps are mounted in a turret on San Pietro.

VENICE (VENEZIA). One dock (*pro.*) able to take any warship; one dock for long cruisers ($525 \times 59 \times 28\frac{1}{2}$ feet); one small dock for third-class cruisers ($295 \times 59 \times 19\frac{1}{2}$ feet). Two large slips, one small slip. Employees 2,797. Depth of Port Lido, 29 feet; of Malamocco, 28 feet at low water. Commercial harbours at both. Admiralty Chart No. 1483.

MADDALENA. No docks. Total employees 113.

ITALIAN FLEET.

Personnel (1910): About 30,298 all ranks.
Colour of Ships: Dark grey.
Minister of Marine: C. A. E. Millo.
Chief of Staff: Vice-Admiral Thaon di Revel.
President of Board of Construction: General E. Ferrati.
Chief of Technical Bureau: General E. Ferrati.

Uniforms.

(*Note.*—A five pointed silver star is worn on lappel of coat).

INSIGNIA OF RANK ON SLEEVES. *NOTE*—STAFF OFFICERS HAVE NO CURL.

Ammiraglio *Admiral*	Vice-Ammiraglio. *V.-Admiral.*	Contr'-Ammiraglio. *R. Admiral.*	Capitano di vascello. *Captain.*	Capitano di fregata. *Commander.*	Capitano di corvetta. *Lieut.-Comdr.*	Tenente di vascello. *Lieut. (senior)*	Sottotenente di vascello. *Lieut. (junior)*	Guardia-marina. *Sub-Lieut*

Lesser rank Allievo di marina (*Naval Cadet*).

Note.—Primo tenente has a gold band on shoulder strap for 12 years seniority. All lieutenants have stars on their shoulder straps corresponding to their stripes.

Other branches: Ingegnere (*Constructor*), Macchinista (*Engineer*), Medico (*Doctor*) Commissario (*Paymaster*)—with relative rank with the executives, without curl.

Colours: *Constructors*, dark purple; *Engineers*, black; *Doctors*, blue; *Paymasters*, red.

Note.—All officers under arms on duty wear a blue sash over right shoulder, ending in a blue knot at left hip; worn with belt. Officers on staff duty wear it on opposite shoulder, and without belt. Undress tunic has insignia of rank on shoulder straps, with stars as stripes. Senior lieutenants wear a piece of gold under the stars of shoulder strap.

Principal Naval Guns. (* = brass cartridge case.)

Notation.	Nominal Calibre.		Model.	Length in Calibres.	Weight of Gun.	Weight of A.P. Shot.	Initial Velocity (*service*).	*Maximum* penetration using *capped* A.P. against K.C. armour (*direct impact*)			Danger Space against average warship, at		
								8000	5000	3000	10,000	5000	3000
	c/m.	in.		cals.	tons.	lbs.	ft. secs.	in.	in.	in	yards.	yards.	yards.
	38	15	'13	...	...	...	...	...	...	...	...	...	...
AA	*34*	13·5	...	30	67	1250	2014	6	10	12	105	300	540
AAAAA	*30·5*	12	...	46	...	850	2900	10	17½	22	...	...	...
AAAA	*30·5*	12	'00	40	49	850	2750	8½	15	19	160	480	725
AAA	*25·4*	10	...	45	32½	500	2700	5½	11	14	140	460	700
AA	*25·4*	10	...	40	30	500	2460	4	8½	10¾	...	...	...
	m/m												
A	*203*	8	...	50 or 45	?	210	2800	3	7½	10½	...	...	...
*A**	*203*	8	...	45	18	210	2600	2	6¾	8½	...	...	...
A	*190*	7·5	...	50	...	...	...	...	...	...	...	...	...
*E**	*152*	6	...	40	6¾	100	2600	...	2¾	4½	60	200	430
*F**	*152*	6	...	40	6½	100	2207	...	...	3¾	40	165	380
*F**	*152*	6	...	40	5¾	100	2149	...	...	3	35	130	320
*F**	*120*	4·7	...	40	2½	44	2180	...	...	...	...	...	...
*F**	*100*	4	...	46	2	31	2600	...	...	...	...	...	...
F°	*76*	3	...	40	¾	12	2600	...	...	...	...	...	...

Most Italian guns are of Elswick model, and differ little from British pieces. Vickers' guns introduced 1908.

The 12 inch, 40 cal. in *Brin* class and *V. Emanuele* class. Cradle mountings.

The 10 inch, 45 cal. in *Garibaldi* class, *St. Giorgio* class. 10 inch Vickers in *Pisa* class.

Torpedoes.

Whiteheads of the usual models.

ONE FUNNEL.

AB Ciclope.

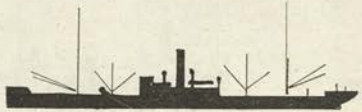
BG C. di Milano.

BH Vulcano.

BK Palinuro.

CG Volta.

CH Atlante.



CJ Bronte *class. Colliers.*

DO Staffeta.

DP Vespucci *class.*

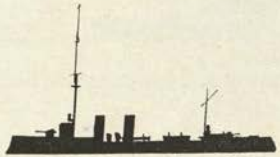
EN Calabria (*page* 305).

EO Gargliano.

EP Curtatone *class.*

TWO FUNNELS (one mast).

GA Agordat.

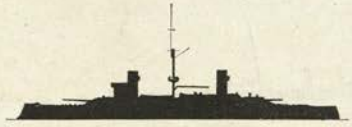


GB Piemonte (*page* 306).

GC Partenope *class.*

GD Iride

HA St. Bon *class* (*page* 301)



HB G. Garibaldi *class* (*page* 300).

HC Sardegna *class* (*page* 303).
Note.—Two funnels forward—closely paired).
(Funnels vary in shape).

TWO FUNNELS.

JG Regina Margherita (*page* 299).
(Note.—Two funnels forward, closely paired).
As *Margherita*, but shorter funnels, Benedetto Brin.

JH Dandolo (*page* 303).

JK Carlo Alberto *class* (*page* 302).

JL Marco Polo (*page* 302).

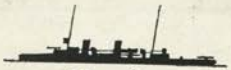
JM Giovanni Bausan (*page* 306).

KG Lombardia *class* (*page* 306).

KH Elba (*page* 305).

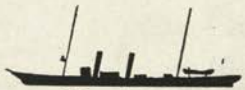
KJ Etna (*page* 305).

KL Tripoli.



KL Goito.

LK R. Yacht, Trinacria.

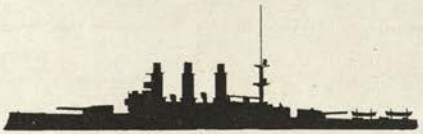


LM Galileo.

J C. di Cavour *class* (*page* 294).

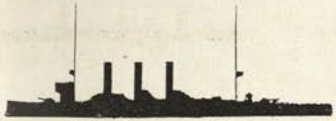
THREE & FOUR FUNNELS.

MA Pisa *class* (*page* 297).



MB Napoli & Roma (*page* 298).

NG V. Emanuele & R. Elena (*page* 298).



NO Libia (*page* 305).

OG Quarto.

PG Montebello.

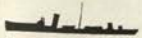
TB San. Giorgio *class* (*page* 296).

TG Italia (*page* 303.)

U D. Alighieri (*page* 295).

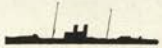
VG Marsala (*page* 304).

TORPEDO CRAFT. **I T** cone. (*pages* 308 *et seq.*).



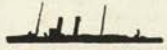
G t.b. Saffo *class.*

H t.b. Pegaso *type.*



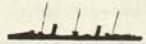
J t.b. Arione *type.*

K t.b. Orfea *type.*

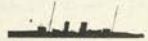


L t.b. Cigno *type.*

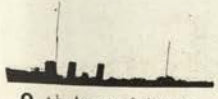
M t.b. 1—38.



N Aquila *class* t.b.



O t.b. Condore. and Pellicano



Q t.b. Animoso & Audace.

P Nembo *class.*

V Lampo *class.*

W Fulmine.

X Artigliere *class.*

Y Ascaro.

Z Impavido & Ardito *classes.*

C. COLOMBO (building), M. COLONNA (building), F. MOROSINI (building), CARACCIOLO (building).

Normal displacement, 30,000 tons. Complement,

Length (*waterline*), feet. Beam, feet. *Mean* draught, feet. Length *over all*, feet.

Guns:
8—15 inch
16—6 inch
20—3 inch

Armour:
" Belt (amidships) ...
" Belt (ends).....
" Deck .....
" side above belt .. ...
" Barbettes .....
" Turrets to these.....
" Battery .....
" Conning tower .....

[Four turrets in centre line, the inside two firing over the outer two.]

Ahead:
4—15 in.

Astern:
4—15 in.

Broadside: 8—15 in.

Machinery: Parsons Turbine. screws. Boilers: Designed H.P. =25 kts.
Coal: *normal* tons; *maximum* tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
C. Colombo	Ansaldo	Ansaldo	'14				
M. Colonna	Odero	Odero	'14				
F. Morosini	Orlando	Orlando	'14				
Caracciolo	Castellamare		'14				

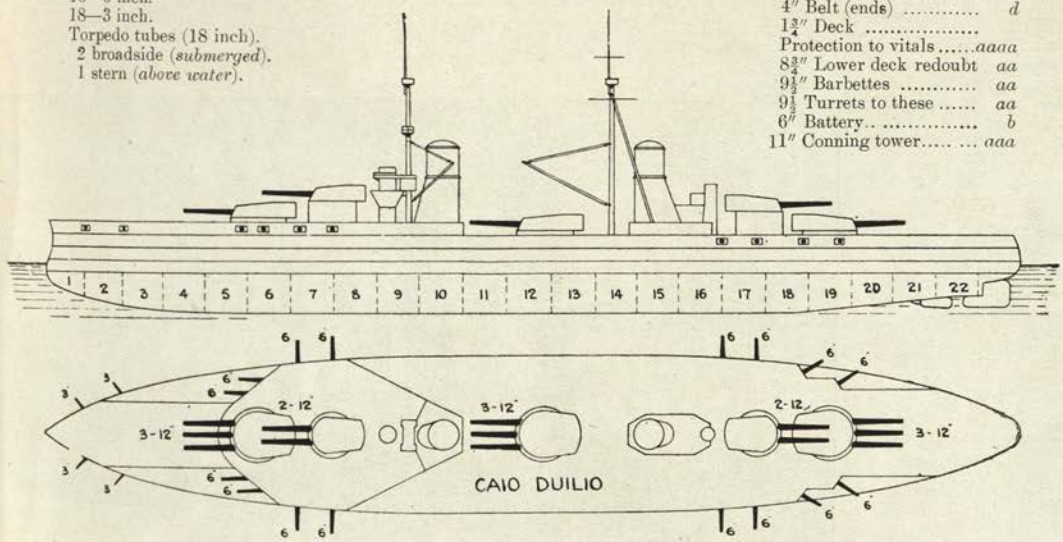
CAIO DUILIO (building), & ANDREA DORIA (building).

Normal displacement, 22,000 tons. Complement, 957.

Length (*waterline*), 575½ feet. Beam, 91¾ feet. *Mean* draught, 27¾ feet. Length *over all*, 577 feet.

Guns:
13—12 in., 46 cal. (A^5).
16—6 inch.
18—3 inch.
Torpedo tubes (18 inch).
2 broadside (*submerged*).
1 stern (*above water*).

Armour (Terni):
9¾″ Belt (amidships) ... *aaa*
4″ Belt (ends) ..... *d*
1¾″ Deck .....
Protection to vitals.....*aaaa*
8¾″ Lower deck redoubt *aa*
9½″ Barbettes ..... *aa*
9½ Turrets to these ..... *aa*
6″ Battery.. ..... *b*
11″ Conning tower..... ... *aaa*



Broadside: 13—12 in.

Machinery: Parsons Turbine. 4 screws. Boilers: Yarrow. Designed H.P. 24,000=22·5 kts.
Coal: *normal* 1000 tons; *maximum* 2500 tons.

Torpedo Notes.—Bullivant net defence to both.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Duilio	Castellamare	Ansaldo	Apr.'12	*To be '15*		Yarrow	
Doria	Spezia	Ansaldo	Mar.'12	„ '15		Yarrow	

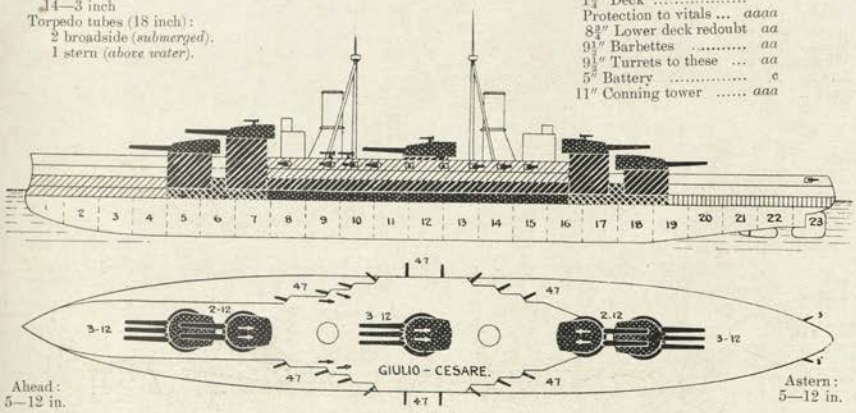
CONTE DI CAVOUR (Aug., 1911), GIULIO CESARE (Oct., 1911) LEONARDO DA VINCI (Nov., 1911).

Normal displacement, 22,000 tons. Complement, 957.

Length (*waterline*), 575½ feet. Beam, 91¾ feet. *Mean* draught, 27¾ feet. Length *over all*, 577 feet.

Guns (see *Notes*):
13—12 in., 46 cal. (A^8).
18—4·7 inch.
14—3 inch
Torpedo tubes (18 inch):
2 broadside (*submerged*).
1 stern (*above water*).

Armour (see *Notes*):
9¾″ Belt (amidships) ... *aaa*
4″ Belt (ends) ..... *d*
1½″ Deck .....
Protection to vitals ... *aaaa*
8¾″ Lower deck redoubt *aa*
9½″ Barbettes ..... *aa*
9½″ Turrets to these ... *aa*
5″ Battery ..... *c*
11″ Conning tower ..... *aaa*



Ahead: 5—12 in.

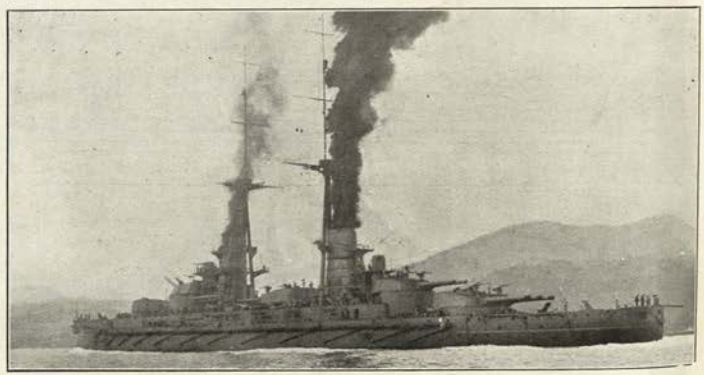
Astern: 5—12 in.

Broadside: 13—12. in.

Machinery: Parsons Turbine. 4 screws. Boilers: *see Notes*. Designed H.P. 24,000=22·5 knots.
Coal: *normal* 1000 tons; *maximum* 2500 tons.

Gunnery Notes.—*L. da V.*, Vickers; others, Elswick.
Armour Notes.—*C. di C.*, Terni; *G.C.*, Bethlehem; *L. da V.*, Midvale.
Torpedo Notes.—Bullivant Net defence to all.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
C. di Cavour	Spezia	Orlando	Jan.'10	'14		Blechynden	
G. Cesare	Odero	Odero	1911	'14		Babcock	
L. da Vinci	Ansaldo	Ansaldo	1911	'14		Blechynden	



LEONARDO DA VINCI

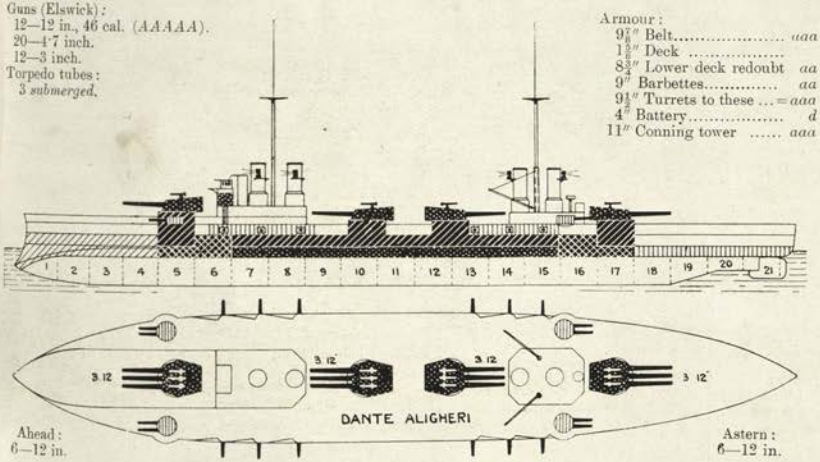
DANTE ALIGHIERI (August, 1910).

Normal displacement, 18,400 tons. Complement, 900.

Length (*waterline*), 541½ feet. Beam, 87¼ feet. *Mean* draught, 27 5/12 feet. Length *over all*, 550 feet.

Guns (Elswick):
12—12 in., 46 cal. (*AAAAA*).
20—4·7 inch.
12—3 inch.
Torpedo tubes:
3 *submerged*.

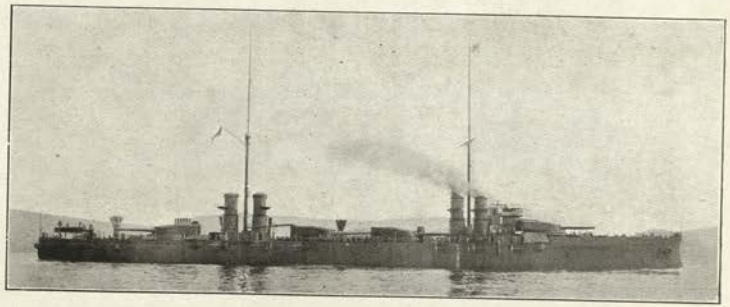
Armour:
9 7/8″ Belt..... *uaa*
1 5/8″ Deck ..... .
8 3/4″ Lower deck redoubt *aa*
9″ Barbettes..... *aa*
9½″ Turrets to these ...= *aaa*
4″ Battery..... *d*
11″ Conning tower ..... *aaa*



Ahead: 6—12 in.

Astern: 6—12 in.

Broadside: 12—12 in.



Machinery: Turbine. screws. Boilers: Blechynden.
Designed H.P. 26,000 = 23 knots. Coal: *normal* 920 tons; *maximum* 3000 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
D. Alighieri	Castellamare	Ansaldo	June '09	1912		Blechynden	

(San Giorgio Class—2 Ships.)

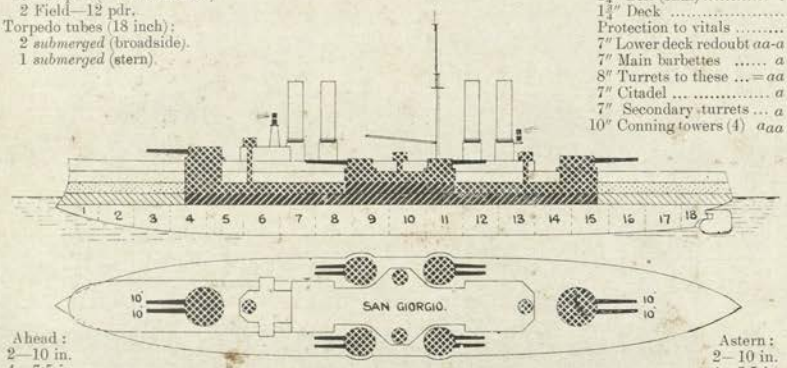
SAN GIORGIO (July, 1908), **SAN MARCO** (December, 1908).

Displacement, 9830 tons. Complement, 550.

Length (*over all*), 462½ feet. Beam, 69 feet. *Maximum* draught, 24 feet.

Guns:
4—10 inch, 45 cal. (*AAA*).
8—7·5 inch, 45 cal. (*A*).
18—12 pdr. (20 in *San Marco*)
2 Field—12 pdr.
Torpedo tubes (18 inch):
2 *submerged* (broadside).
1 *submerged* (stern).

Armour (*S.M.*, Midvale; *S.G.*, Terni):
8″ Belt (amidships) ..... *aa*
2½″ Belt (ends) ..... *e*
1¾″ Deck .....
Protection to vitals .....
7″ Lower deck redoubt *aa-a*
7″ Main barbettes ..... *a*
8″ Turrets to these ... = *aa*
7″ Citadel ... . *a*
7″ Secondary turrets ... *a*
10″ Conning towers (4) *aa*



Ahead:
2—10 in.
4—7·5 in.

Astern:
2—10 in.
4—7·5 in.

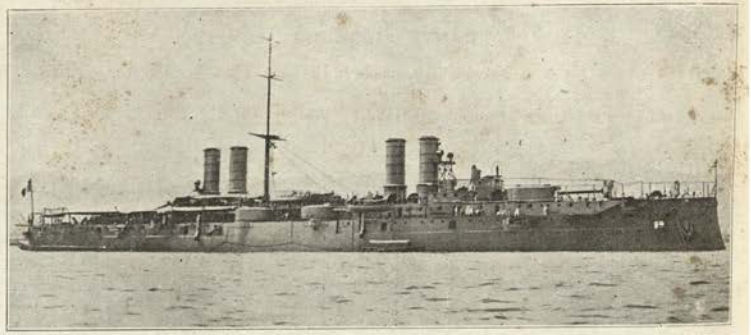
Broadside: 4—10 in., 4—7·5 in.

Machinery: *S. Marco*, Parsons turbine; others, 2 sets 4 cylinder triple expansion. 2 screws. Boilers: various. See *Notes*. Designed H.P., *S. Giorgio*, 18,000 = 22·5 kts.; *S. Marco*, 20,000 = 23 kts. Coal: *normal* 700 tons; *maximum* 1500 tons.

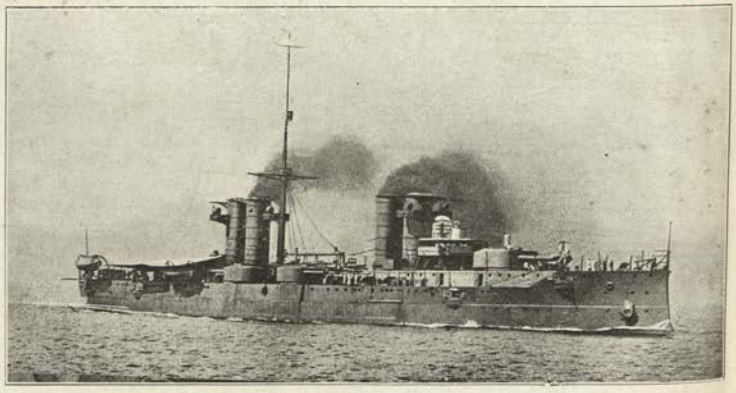
Gunnery Notes.—All guns electrically controlled. Central pivot mountings. Fore 10 inch 31 feet above water line; after 10 inch, 22 feet; 8 inch guns 22 feet above water. The 12 pdrs. are placed 8 forward, 2 by conning tower, 6 amidships.

Engineering Notes.—

Name.	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials:— full power*	*Boilers*	*Best recent speed*
S. Giorgio	Castellamare	Ansaldo	July, '05	'10	= 24	Blechynden	
S. Marco	Castellamare	Ansaldo	Jan., '07	'10	=	Babcock	



San Giorgio. Searchlight *low* on aftermost funnel. *No* searchlight platform on mast.



San Marco. Searchlight *high* on aftermost funnel. Searchlight platform on mast.

PISA CLASS—(2 SHIPS).

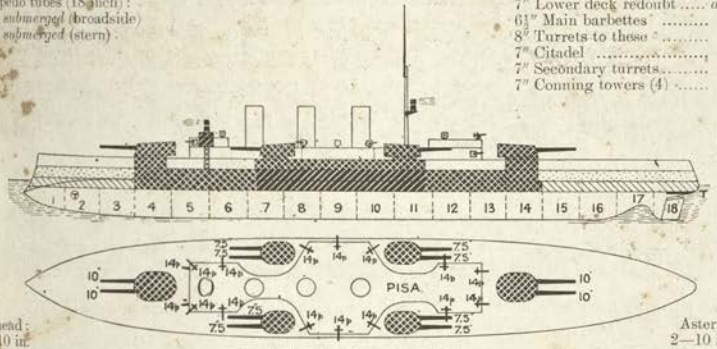
PISA (Sept., 1907), **AMALFI** (May, 1908).

Displacement, 10,118 tons (metric). Complement, 550.

Length (*over all*), 461 feet. Beam, 69 feet. *Maximum* draught, 24¾ feet.

Guns (Vickers):
4—10 inch, 45 cal. (*AAA*)
8—7·5 inch, 45 cal. (*A*)
16—14 pdr.
2 Field—12 pdr.
Torpedo tubes (18 inch):
2 *submerged* (broadside)
1 *submerged* (stern).

Armour (Vickers):
8″ Belt (amidships) ..... *aa*
3½″ Belt (ends) ..... *c*
2″ Deck .....
Protection to vitals .....
7″ Lower deck redoubt ..... *aa-a*
6½″ Main barbettes ..... *a*
8″ Turrets to these ..... *a*
7″ Citadel ..... *a*
7″ Secondary turrets ..... *a*
7″ Conning towers (4) ..... *a*



Ahead:
2—10 in.
4—7·5 in.

Broadside: 4—10 in., 4—7·5 in.

Astern:
2—10 in.
4—7·5 in.

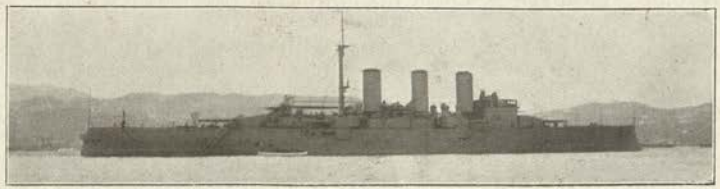
Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: Belleville. Designed H.P. 19,000=22·5 kts. Coal: *normal* 660 tons; *maximum* 1500 tons.

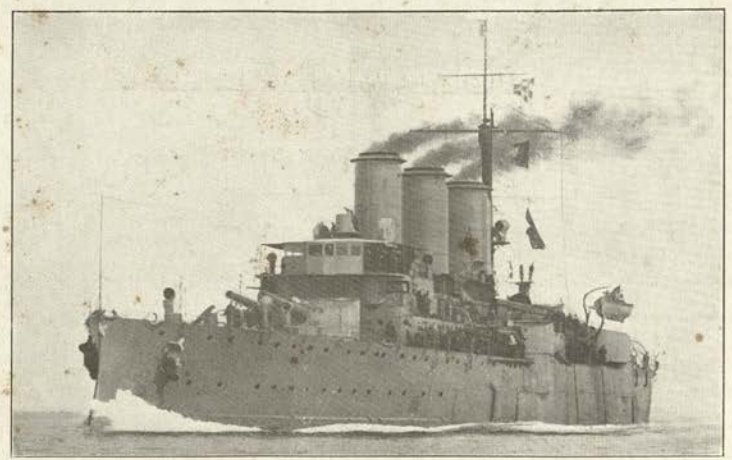
Gunnery Notes.—All guns electrically controlled. Central pivot mountings. Guns 22 feet above water.

Engineering Notes.—

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*Trials*		*Boilers*	*Best recent speed*
Pisa	Orlando	Orlando	Feb., '05	Jan., '09		24 hrs.	=21·1 kts.	Belleville	
						6 hrs.	=23·1 „		
Amalfi	Odero, Genoa	Odero	July, '05	June, '09			=23·6 „	Belleville	

General Notes.—Designed by Orlando.





AMALFI.

(V. Emanuele Class—4 Ships).

VITTORIO EMANUELE (Nov., 1904), **REGINA ELENA** (June, 1904), **NAPOLI** (Sept., 1905), **ROMA** (April, 1907).

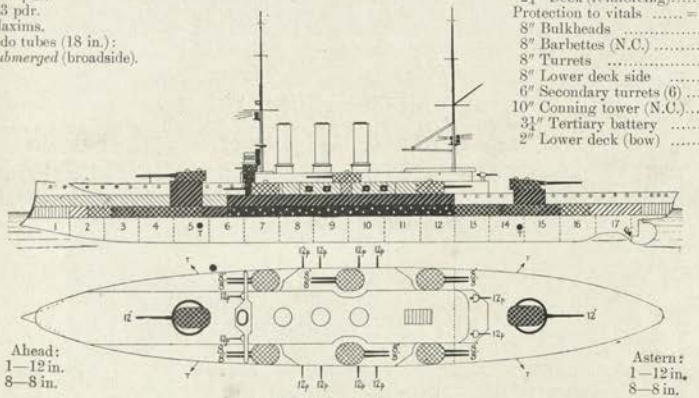
Displacement, 12,625 tons (metric). Complement, 1000.

Length (*p.p.*), 435 feet, Beam, 73½ feet. *Maximum* draught, 28¼ feet. Length *over all*, 475 feet.

Guns:
2—12 inch, 40 cal. (*AAAA*).
12—8 inch, 45 cal. (*A*).
24—12 pdr.
2—3 pdr.
2 Maxims.
Torpedo tubes (18 in.):
2 *submerged* (broadside).

Armour (Terni):

10″ Belt	*aaa*
4″ Belt (ends)	*d*
2½″ Deck (reinforcing)	
Protection to vitals =	*aaaa*
8″ Bulkheads	*aa*
8″ Barbettes (N.C.)	*aa*
8″ Turrets	*a*
8″ Lower deck side	*aa*
6″ Secondary turrets (6)	*b*
10″ Conning tower (N.C.)	*aa*
3½″ Tertiary battery	*e*
2″ Lower deck (bow)	*e*



Ahead:
1—12 in.
8—8 in.

Astern:
1—12 in.
8—8 in.

Broadside: 2—12 in., 6—8 in.

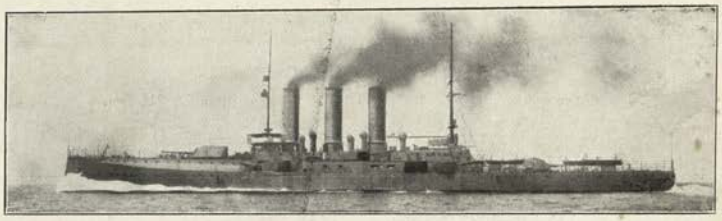
Machinery: 2 sets 4 cylinder vertical inverted triple expansion. Designed H.P. 20,000=21 kts. 2 screws. Boilers: *V. Emanuele* and *R. Elena*, 28 Belleville; *Napoli* and *Roma*, Babcock & Wilcox. Coal: *normal* 1000 tons; *maximum* 2000 tons.

Gunnery Notes.—Big guns: cradle mountings. All guns electric control. Electric hoists. The arcs of fire are very large: 12 inch, 300°; amidships, 8 inch, 180°; end, 8 inch, 135° from axial line. 12 pdrs. about 100°.

Armour Notes.—Main belt is 9⅝ feet wide. Upper belt 7½ feet wide. Armoured fire control on top of conning tower.

Torpedo Notes.—Elswick '04 pattern submerged tubes.

Engineering Notes.—Two condensers of special pattern to each set of engines. Yarrow-Schlick-Tweedy engines.



V. Emanuele & R. Elena. *Photo by favour of C. de Grave Sells, Esq.*

Napoli & Roma (note different rig). *Roma* has a searchlight platform on mast, *Napoli* has not.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last Refit*	*First Trials:* 24 hours	*First Trials:* 6 hours	*Boilers*	*Best recent speed*
V. Emanuele	Castellamare	Orlando	Sept.'01	Sept.'07		16,000=21	=	Belleville	
R. Elena	Spezia	Odero	Sept.'01	May,'07		15,473=20·33	19,298=22·7	Belleville	21·9
Napoli	Castellamare	Hawthorn Gup.	Oct. '03	Nov.'08		=	20,000=	Babcock	
Roma	Spezia	Ansaldo	Sept.'03	Dec. '08		16,000=20·5	21,000=22·5	Babcock	

General Notes.—Designed by General Cuniberti. Average cost per ship, £1,000,000. The *Napoli* and *Roma* have less superstructure and are somewhat lighter, but have the same horse power (not fitted as flagships). Weight is saved in every possible way, strength being obtained by a special girder construction. All the usual wooden fittings are of asbestos. Bilge keels fitted to all, 1908.

(Brin Class—2 Ships).

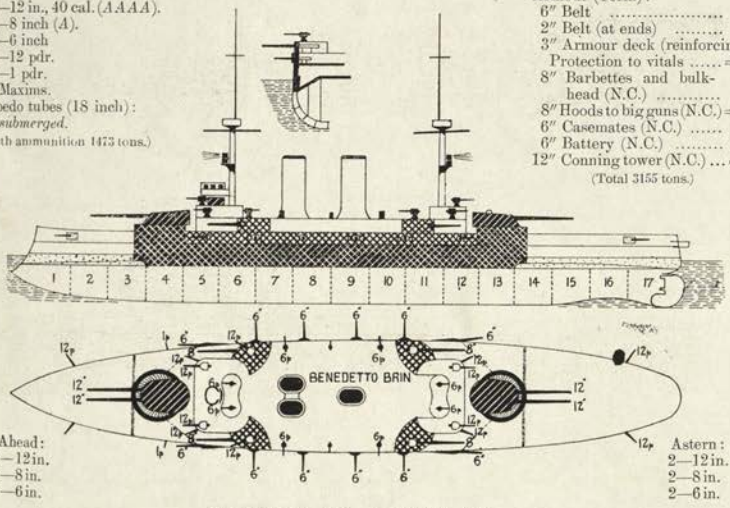
BENEDETTO BRIN (Nov., 1901), & REGINA MARGHERITA (May, 1901).

Displacement 13,427 tons. Complement 720.

Length (*p.p.*), 426½ feet. Beam, 78 feet. *Mean* draught, 27¾ feet. Length *over all*, 455 feet.

Guns:
4—12 in., 40 cal. (*AAAA*).
4—8 inch (*A*).
12—6 inch
20—12 pdr.
2—1 pdr.
2 Maxims.
Torpedo tubes (18 inch):
4 *submerged*.
(With ammunition 1473 tons.)

Armour (Terni):
6″ Belt ..... *a*
2″ Belt (at ends) ..... *f*
3″ Armour deck (reinforcing) Protection to vitals .....=*aa*
8″ Barbettes and bulkhead (N.C.) ..... *a*
8″ Hoods to big guns (N.C.)=*aa*
6″ Casemates (N.C.) ..... *b*
6″ Battery (N.C.) ..... *b*
12″ Conning tower (N.C.) ... *aaa*
(Total 3155 tons.)



Ahead:
2—12 in.
2—8 in.
2—6 in.

Astern:
2—12 in.
2—8 in.
2—6 in.

Broadside: 4—12 in., 2—8 in., 6—6 in.

Machinery: About 1,600 tons. 2 sets 4 cylinder triple expansion. 2 screws. Boilers: (26) *Brin*, Belleville; *Margherita*, Niclausse. Designed H.P. *natural* draught 15,500=18 kts.; *forced* 19,000=20 kts. Coal: *normal* 1,000 tons; *maximum* 2,000 tons. *Nominal* radius 10,000 at 10 kts.

Gunnery Notes.—Big guns: central pivot mountings, load at any elevation.

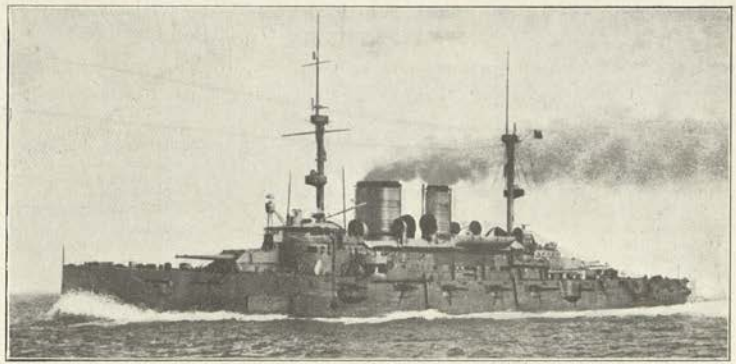
Arcs of fire: Big guns 240°, 8 in. and end 6 in. 135° from axial line; other 6 in. 125°.

Armour Notes.—The main belt is 10½ feet wide. Armoured main deck 1¾″ extends whole length of ship.

Engineering Notes.—Machinery and boilers weigh 1603 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last Refit*	*First Trials*		*Boilers*	*Best recent speed*
B. Brin	Castellamare	Hawthorn Gup.	Feb.'99	1904		15,600=18	20,478=20·4	Belleville	
R. Margherita	Spezia	Ansaldo	Nov.'98	1904		17,600=18·5	19,822=20·2	Niclausse	

General Notes.—Freeboard, 21 feet forward. Weight of hull, 6195 tons. Forward funnels paired abreast. Average cost per ship, *complete*, £1,150,000.



Benedetto Brin. *Photo by favour of C. de Grave Sells, Esq.*

Regina Margherita. *Photo, Bougault, Toulon.*

Difference.—*Brin* has much shorter funnels than *Margherita*.

ITALIAN BATTLESHIPS (II cl.)

(G. Garibaldi Class—3 Ships.)

GIUSEPPE GARIBALDI (June, 1899), **VARESE** (Aug., 1899),
and **FRANCESCO FERRUCCIO** (April, 1902).

Displacement, 7400 tons. Complement, 517.

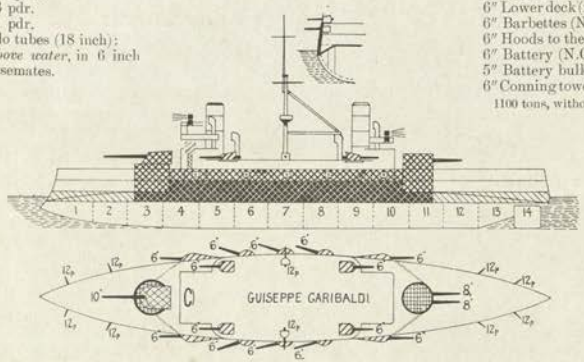
Length (*p.p.*), 344 feet. Beam, 59 feet. *Maximum* draught, *about* 25 feet.

Guns:
1—10 inch, 45 cal. (*AAA*).
2—8 inch, 45 cal. (*A*).
14—6 inch, 40 cal.
10—12 pdr.
6—3 pdr.
2—1 pdr.
Torpedo tubes (18 inch):
4 *above water*, in 6 inch casemates.

Armour (Terni):

6″ Belt (amidships)	*a*
3″ Belt (ends)	*e*
1½″ Deck	
Protection to vitals =	*aa*
6″ Lower deck (redoubt)	*a*
6″ Barbettes (N.C.)	*b*
6″ Hoods to these (N.C.)	*b*
6″ Battery (N.C.)	*b*
5″ Battery bulkheads	*c*
6″ Conning tower (N.C.)	*b*

1100 tons, without deck.



Ahead:
1—10 in.
2—6 in.

Astern:
2—8 in.
2—6 in.

Broadside: 1—10 in., 2—8 in., 7—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers (24): *Varese*, Belleville; *G. Garibaldi* and *Ferrucio*, Niclausse. Designed H.P. 13,500 = 20 kts. Coal: *normal* 650 tons; *maximum* 1200 tons.

Armour Notes.—2″ screens in battery, one fore and aft, one athwartships, between sections 6 and 7.

Gunnery Notes.—Big guns: central pivot mountings. Electric hoists to all guns.

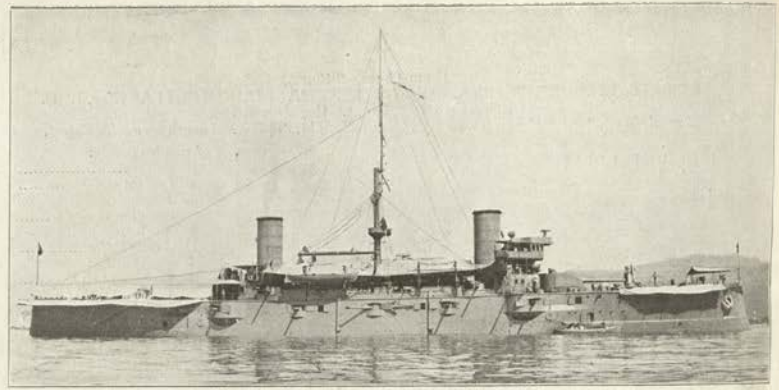
Torpedo Notes.—Tubes are in casemates, with 2 in. sides and backs.

Engineering Notes.—*G. Garibaldi* engines. Maudslay design; other two, Hawthorn Guppy's design.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*Trials:* 6 hours at 3/5 power	*Trials:* 1/4 hours full power	*Boilers*	*Best recent speed* (mean)
G. Garibaldi	Ansaldo	Ansaldo	Sep. '98	1901		9948 = 17·9	14,713 = 19·66	Niclausse	17·2
Varese	Orlando	Orlando	Sep. '98	1901		9479 = 18·36	13,885 = 20·2	Belleville	16·8
F. Ferruccio	Venice	Hawth'n Guppy	1899	1904		=	13,635 =	Niclausse	17·9

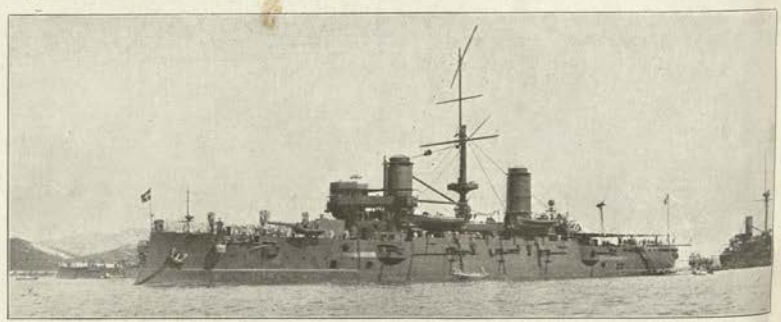
Coal consumption: *Varese* burns 11¾-12 tons an hour at full power (20 kts.); *G. Garibaldi*, 12¼ tons.

General Notes.—Average cost per ship, *complete*, about £600,000.

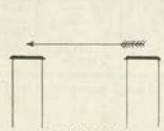


G. Garibaldi and *with slight differences* Varese. *Photo, Ciricchioni.*

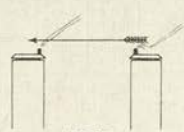
Differences.—*Varese* has a much larger fighting-top than *Garibaldi*.



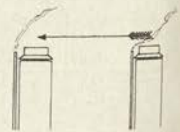
F. Ferruccio. *Photo, Ciricchioni.*



G. GARIBALDI



VARESE



F. FERRUCIO

1895 ITALIAN BATTLESHIPS.

(St. Bon Class—2 Ships).

AMMIRAGLIO DI St. BON (April, 1897), & **EMANUELE FILIBERTO** (Sept., 1897).

Displacement, 9800 tons. Complement, 542.

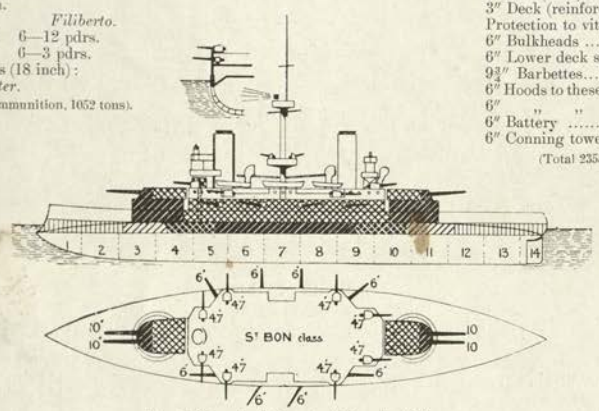
Length (*p.p.*), 344½ feet. Beam, 69 feet. *Maximum* draught, 26 feet.

Guns:
4—10 inch, 40 cal. (*AA*).
8—6 inch, 40 cal.
8—4·7 inch.

St. Bon.	*Filiberto.*
8—6 pdrs.	6—12 pdrs.
	6—3 pdrs.

Torpedo tubes (18 inch):
4 *above water*.
(Total with ammunition, 1052 tons).

Armour (Harvey nickel):
9¾″ Belt (amidships) ..... *aa*
4″ Belt (ends) ..... *d*
3″ Deck (reinforcing) .....
Protection to vitals ... = *aaa*
6″ Bulkheads ..... *b*
6″ Lower deck side ..... *b*
9¾″ Barbettes ..... *aa*
6″ Hoods to these (fronts) = *aa*
6″ ,, ,, (sides) *b*
6″ Battery ..... *b*
6″ Conning tower ..... *b*
(Total 2355 tons).



Ahead:
2—10 in.
2—6 in.
2—4·7 in.

Astern:
2—10 in.
2—6 in.
2—4·7 in.

Broadside: 4—10 in., 4—6 in., 4—4·7 in.

Machinery: 1300 tons. 2 sets 3 cylinder triple expansion. 2 screws. Boilers: 12 cylindrical, 36 furnaces. Designed H.P. *natural* 9000 = 16 kts., *forced* 13,500 = 18 kts. Coal: *normal* 600 tons and petroleum: *maximum* 1000 tons.

Gunnery Notes.—Observe differences in tertiary armaments. Bow guns 22 feet above water.

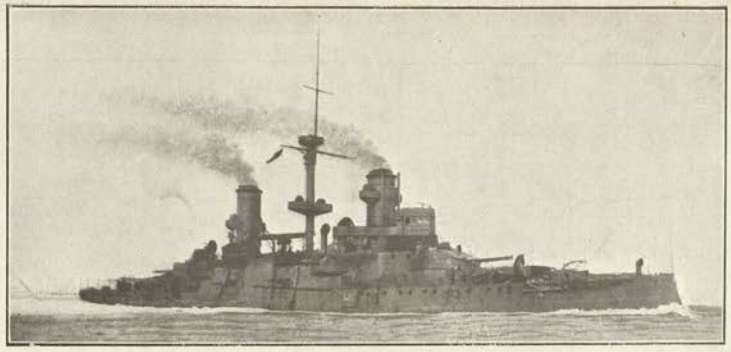
Armour Notes.—2″ floor to main deck battery. Cofferdam behind belt.

Engineering Notes.—Machinery made in Italy from British designs (Maudslay).

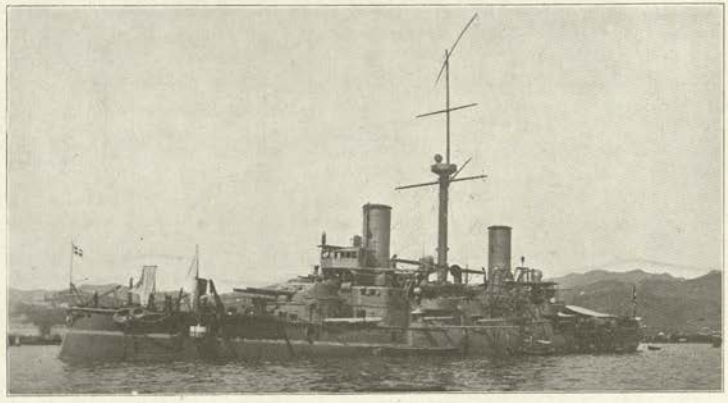
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*Trials:*— *6 hrs. natural (94 revs.)*	*1½ hours (104 revs.)*	*Boilers*	*Best recent speed*
St. Bon	Venice	Ansaldo	1895	1901		10,459 = 17·54	14,296 = 18·3	Cylindrical	
Filiberto	Castellamare	Hawth'n Guppy	1895	1901		9959 = 16·79	13,552 = 18·0	Cylindrical	16·2

Coal consumption about 9 tons an hour at 9000 H.P. (16 kts.), 14½ tons an hour at 13,500 H.P. (18 kts.). Pressure at full speed, 150 lbs.

General Notes.—Freeboard forward 14½ feet; aft 10 feet. Average cost per ship complete, about £700,000.

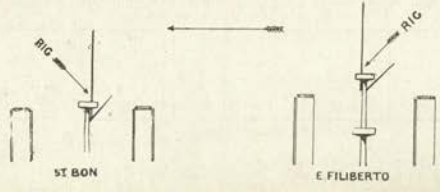


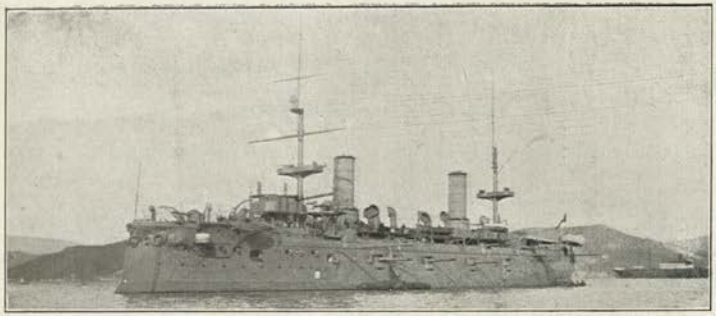
E. Filiberto (starboard side).



St. Bon (port side). *Photo, Rossetti*

Difference.—Easily distinguished by the different height of funnels and by positions of topmasts.





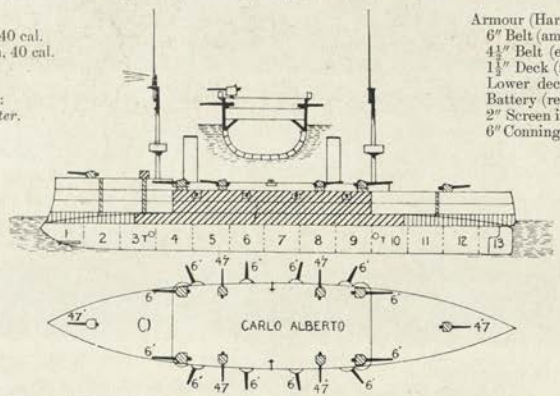
CARLO ALBERTO (1896), VETTOR PISANI (1895).

Displacement, 6500 tons. Complement, 500. Length (*p.p.*), 324¾ ft. Beam, 59 ft. *Maximum* draught, 24¼ ft.

Guns:
12—6 inch, 40 cal.
6—4·7 inch, 40 cal.
14—6 pdr.
2—1 pdr.
Torpedo tubes:
4 *above water.*

Armour (Harvey):

6″ Belt (amidships) ...	*c*
4½″ Belt (ends).....	*d*
1½″ Deck (flat on belt)	
Lower deck (redoubt)	*c*
Battery (redoubt).....	*c*
2″ Screen in battery...	
6″ Conning tower (fore)	*c*



Ahead:
2—6 in.
1—4·7 in.

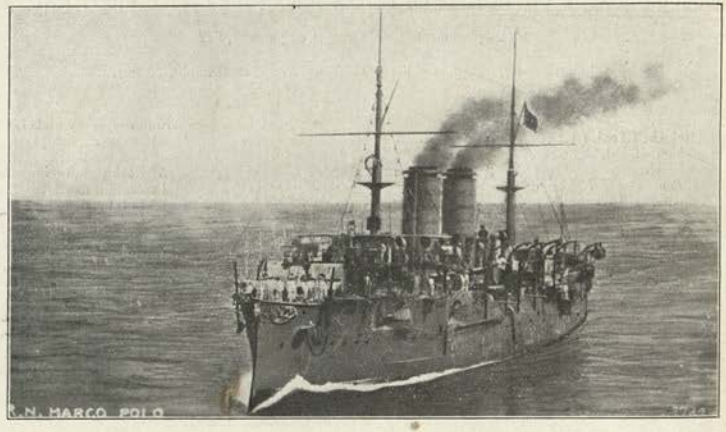
Astern:
2—6 in.
1—4.7 in.

Machinery: 2 sets 3 cylinder triple expansion. 2 screws. Boilers: 8 cylindrical. Designed H.P. *natural* 8600=17 kts.; *forced* 13,000=19 kts. Coal: *normal* 600 tons; *maximum* 1000 tons and fuel.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last Refit*	*Trials:* 6 *hours n.d.*	1½ *hours f.d.*	*Boilers.*	*Present best speed*
C. Alberto	Spezia	Ansaldo	1893	1898	1904	8821=17·7	13,116=19·11	Cyl.	18
V. Pisani	Castellamare	Hawthorn Guppy	Dec.'92	1899	1905	8290=17·5		Cyl.	

Now rigged as plan.

1892 ITALIAN "BATTLESHIPS." 1890



MARCO POLO (1892).

Displacement 4583 tons. Complement 394.

Length (*p.p.*), 327 feet. Beam, 48¼ feet. *Maximum* draught, 21½ feet.

Guns:
6—6 inch, 40 cal., *old.*
4—4·7 inch *old.*
6—6 pdr.
2—1 pdr.
2 machine.
Torpedo tubes:
4 *above water.*

Armour (steel)

4″ Belt.....	*c*
1″ Deck (flat on belt)	
Protection to vitals is	*c*
4″ Bulkheads	*c*
Conning tower	

Ahead:
3—6 in.

Astern:
3—6 in.

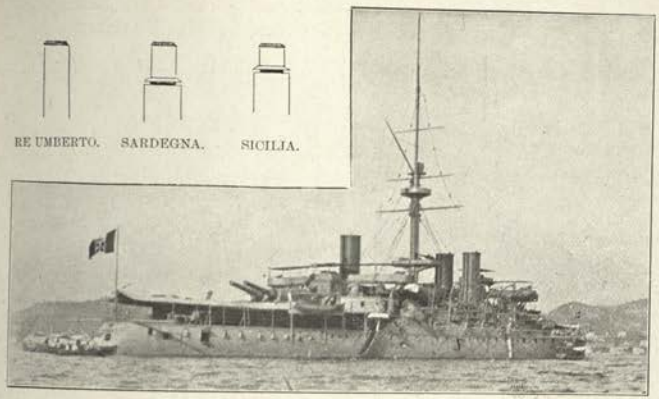
Broadside: 4—6 in., 2—4·7 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: 4 cylindrical. Coal: 600 tons. Designed H.P. *forced* 10,600=19 kts.

Armour Notes—Belt is 214 feet long.

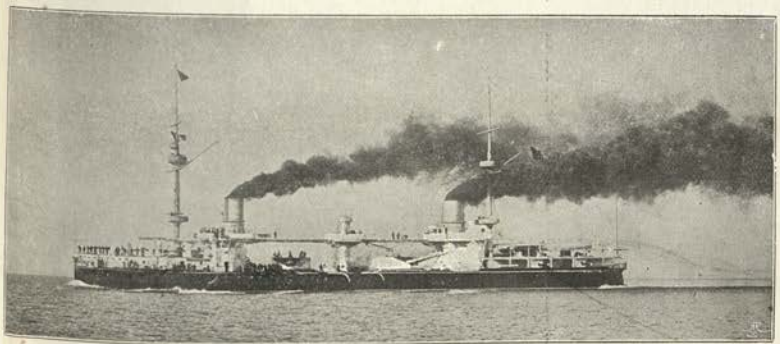
Engineering Notes—This ship has never reached her designed speed by at least a knot. On first *trials* 7047 I.H.P.=16.86 knots, and 10,664=17·8 kts. Machinery, Maudslay design by Ansaldo.

General Notes—Laid down at Castellamare, 1890. Completed 1895. Total cost about £400,000.

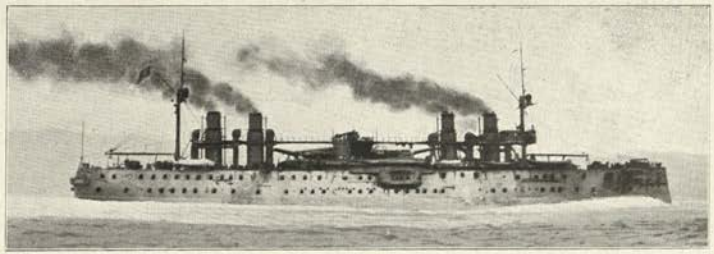


SICILIA (1891). 13,375 tons
RE UMBERTO (1887). 13,251 tons } 400¼ × 76¾ × *max.* 29 feet.
SARDEGNA (1890). 13,860 tons 410 × 76¾ × *max.* 29¼ feet.

Guns: 4—old 13·5 (*AA*), 8—old 6 inch, 16—4·7 inch, 20—6 pdr. (18 only in *Re Umberto*). Torpedo tubes: 6 *above water*. Armour (steel): 4½″ Belt amidships, 14″ Barbettes. Original speed about 20 kts. They can still steam pretty well.



DANDOLO (1878) (reconstructed 1899). 12,265 tons. Guns: 4—10 in., 40 cal. (*AA*), 7—6 in., 5—4·7 in., 16—6 pdr., 8—1 pdr. Tubes: 4 *above water*. Armour (steel): Belt amidships, 21½″, Turrets (Harvey), 10″. Original speed after reconstruction over 15 kts.

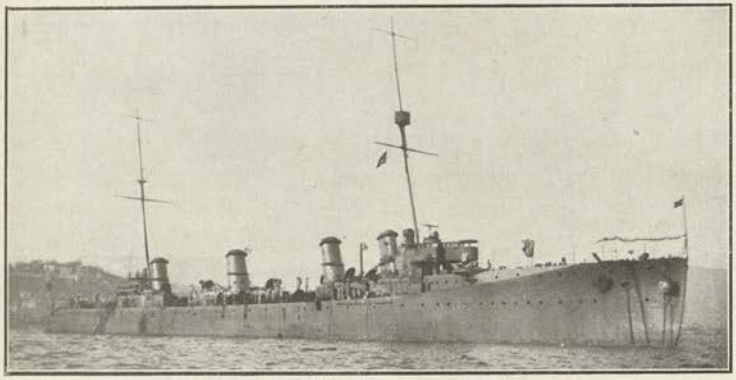


ITALIA.

Torpedo Schoolship. **ITALIA** (1880). Displacement 15,654 tons. Complement 675.

Length (*waterline*), 400¼ feet. Beam, 75½ feet. *Maximum* draught, 33 feet.

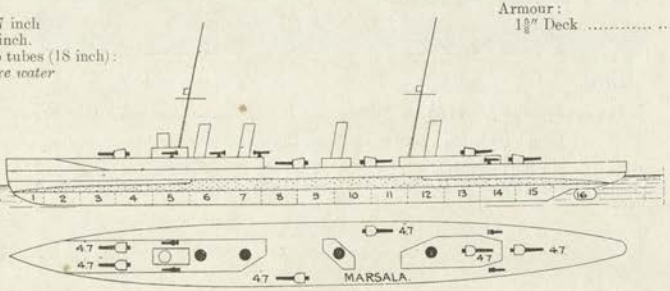
Guns: 4—old 100 ton, 8—old 6 in., 4—old 4·7, 32 small guns. Armour: No belt, 3″ deck and 19″ steel redoubt on upper deck for big guns. Original speed between 17 and 18 kts. Coal *about* 3000 tons maximum.



MARSALA (March, 1912), **NINO BIXIO** (Dec., 1911) and *1 other (pro).*
Displacement, 3,470 tons. *Complement, 197.
Length (*p.p.*), 431 feet. Beam, 42¾ feet. *Mean* draught, 13¼ feet.

Guns:
6—4·7 inch
6—3 inch.
Torpedo tubes (18 inch):
2 above water

Armour:
1⅝″ Deck .....



Machinery: Parsons turbine. Boilers: 14 Blechynden. Designed H.P. 22,500=28 kts, 400 tons coal and 100 tons oil.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Marsala	Castellamare	Off. Mecc. Naples	1911	1913	–		
Nino Bixio	Castellamare		1911	1913	–		
D				1914	–		

General Notes.—Carry 200 blockade mines.

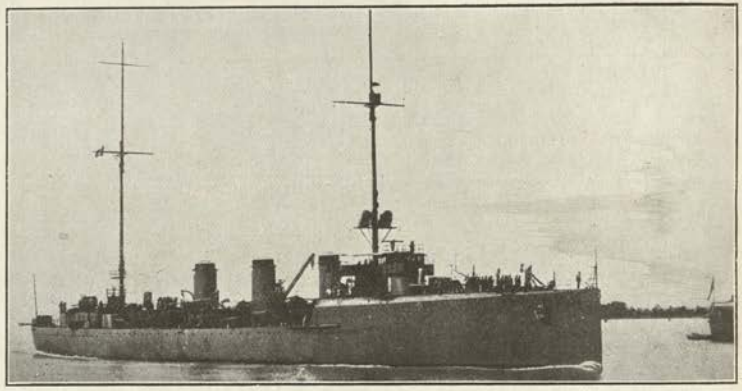
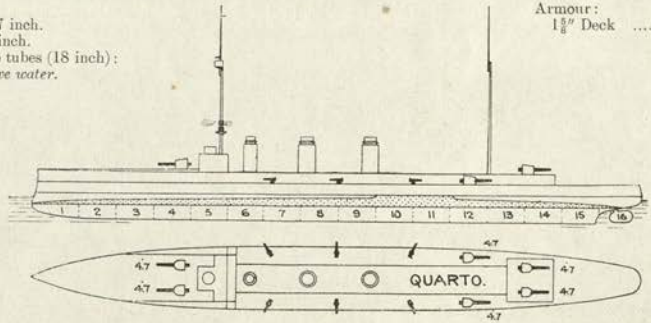


Photo by favour of C. de Grave Sells, Esq.

QUARTO (Aug., 1911).
Displacement, 3300 tons Complement, 197.
Length (*p.p.*), 417 feet. Beam, 42¼ feet. *Mean* draught, 13 feet.

Guns:
6—4·7 inch.
6—3 inch.
Torpedo tubes (18 inch):
2 above water.

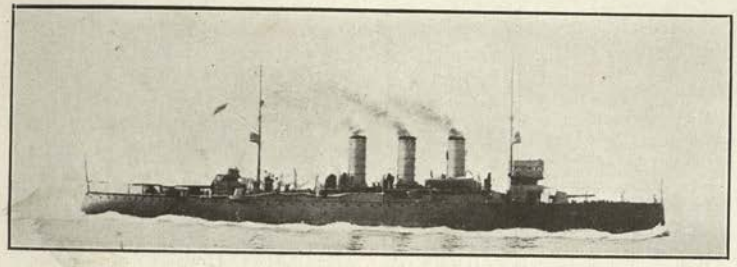
Armour:
1⅝″ Deck .....



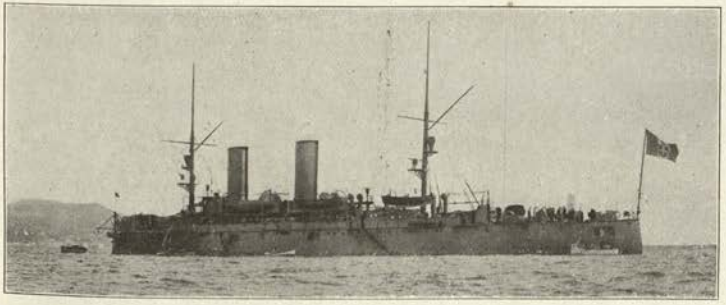
Machinery: Parsons turbine. Boilers: 10 Blechynden. Designed H.P. 25,000=28 kts. Oil fuel only: *normal* 450 tons; *maximum* 800 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Quarto	Venice Y.	Odero	Nov.'09	1912	–	Blechynden	

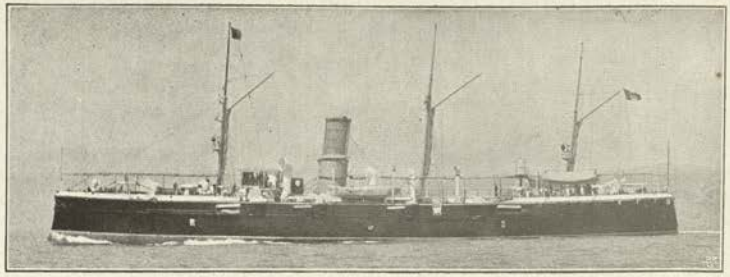
General Notes.—Carries 200 blockade mines



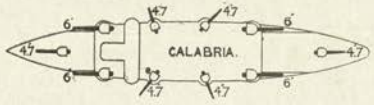
LIBIA (*ex Drama*) (Nov., 1912). 3800 tons. Dimensions: 345 (*p.p.*) × 47½ × 16 feet. Armament: 2—6 inch, 45 cal., 8—4·7 inch, 50 cal., 2—18 inch tubes (*above water*). Deck, 4″. Designed H.P. 12,500 = 22 kts. Niclausse boilers. Coal: *normal* 275 tons, *maximum* 600 tons. Built and engined by Ansaldo. Originally the Turkish *Drama*. Cost, £200,000.

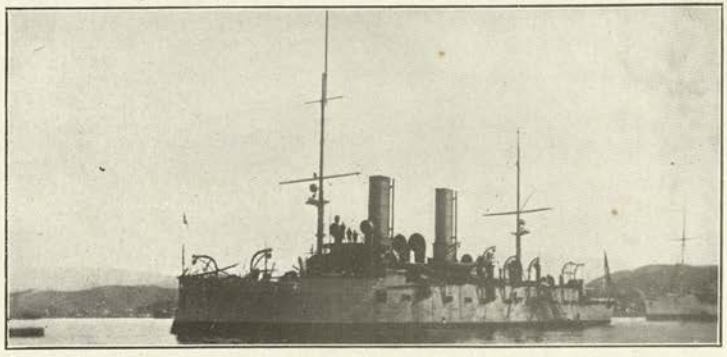


PUGLIA (Sept., 1898). 2538 tons. Complement, 274. Dimensions (*p.p.*): 273 × 40¾ × 16¼ feet. Armament: 6—4·7 inch, 40 cal., 6—6 pdr., 2—1 pdr., 2 Machine, 1—12 pdr. Field, 2—18 inch tubes (*above water*). Deck, 2″. Designed H.P. 7500 = 18·5 kts. Cylindrical boilers. Coal: *maximum* 650 tons + oil. Built at Taranto Yard, engined by Odero. Made 19 kts. on first trials. Cost, £200,000.

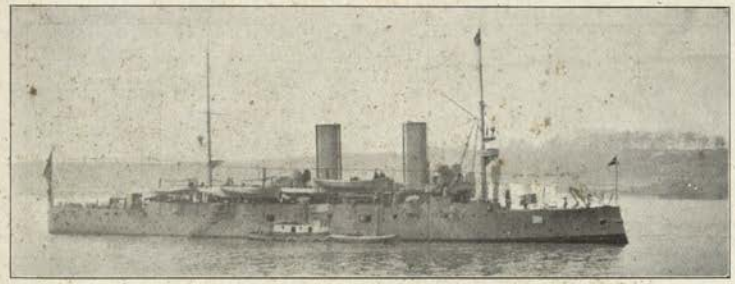


CALABRIA (1894). 2492 tons. Sheathed and zinced. Complement, 254. Dimensions (*p.p.*): 249 × 42⅔ × 17¼ feet (*max.*) Armament: 4—6 inch, 6—4·7 inch, 6—6 pdr., 2—1 pdr., 2 Machine, 2—14 inch tubes. 2″ Deck. Designed H.P. 4000 = 16 kts. Boilers: cylindrical. Coal: *maximum* 500 tons + oil. Built at Spezia. Cost, £185,000.



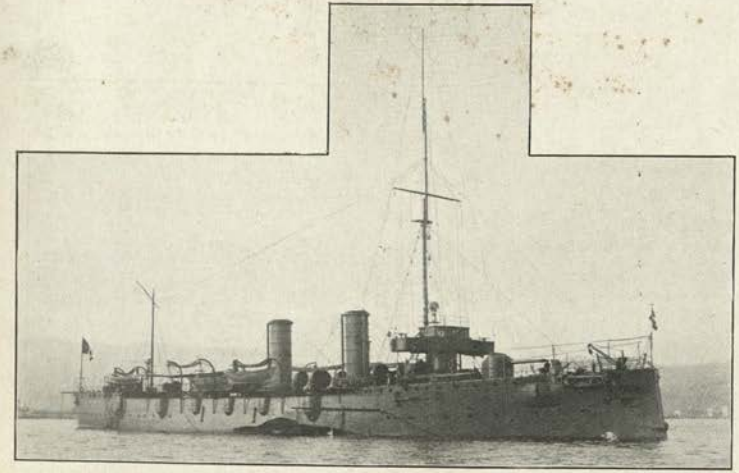


ELBA (1893). (Balloon ship.) 2730 tons. Complement, 247. Dimensions (*p.p.*): 272½ × 42⅔ × 18 feet (*max.*) Armament: 6—4·7 inch, 40 cal., 4—6 pdr., 2—1 pdr., 1—12 pdr. Field, 2—14 inch tubes (*above water*). Deck, 2″. Designed H.P. 7500 = 18·5 kts. Cylindrical boilers. Coal: 500 tons + oil. Built at Castellamare.

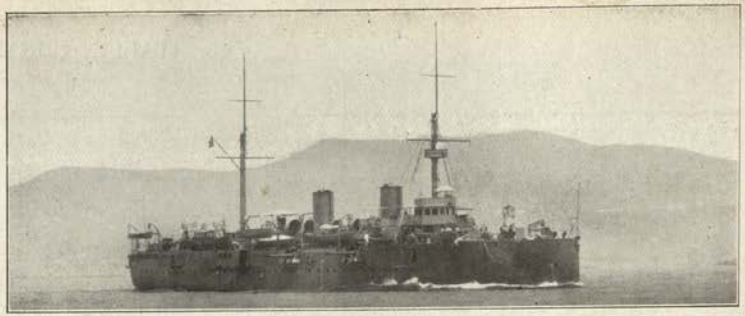


Photo, E. G. Romanes, Esq.

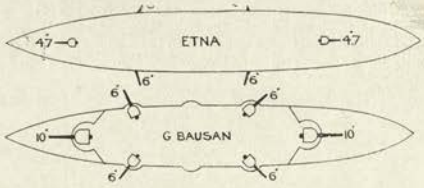
LOMBARDIA (1890), **ETRURIA** (1891), **LIGURIA** (1893). 2280 tons. Complement, 246. Dimensions (*p.p.*), 262½ × 39⅓ × 17 feet (*maximum*). Armament: 6—4·7 inch, 40 cal., 6—6 pdr., 2—1 pdr., 3—14 inch tubes (*above water*). Deck 1″. Designed H.P. 7500 = 18·5 kts. Cylindrical boilers. Coal 430 tons.

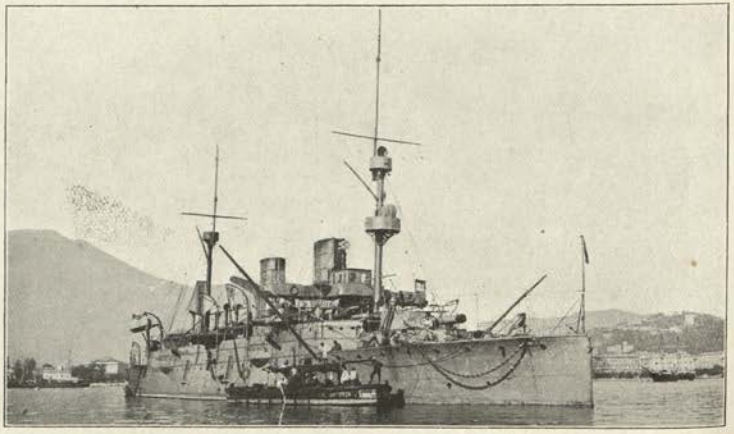


PIEMONTE (Elswick, 1888). 2650 tons. Complement, 325. Dimensions (*p.p.*), 305 × 38 × 16 feet (*maximum*). Armament: 10—4·7 inch, 6—6 pdr., 2—1 pdr., 2 Maxims. 2—14 inch tubes (*above water*). Deck 3″. Conning tower 3″. Designed H.P. 12,000 = 23 kts. Cylindrical boilers. Coal: *normal* 200 tons, *maximum* 500 tons.



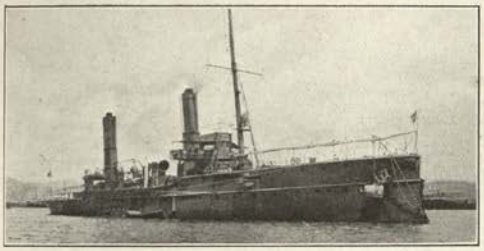
ETNA (1885). 3530 tons. Complement, 308. Dimensions: 283⅓ × 42½ × 20 feet (*maximum*). Armament: 4—6 inch, 2—4·7 inch, 2—12 pdr., 4—6 pdr., 2—3 pdr. 3—14 inch tubes (*above water*). Deck 2″. Designed H.P. 7480 = 17·8 kts. Coal: *normal* 600 tons. (*Training Service*).



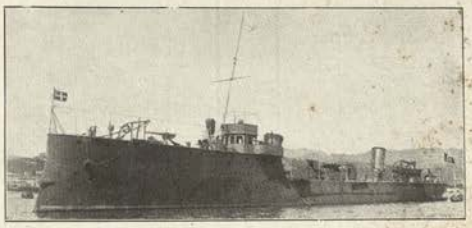


GIOVANNI BAUSAN (Elswick, 1883). 3330 tons. Dimensions: 278 × 42 × 19 feet. Armament: 2—old 10 inch, 4—6 inch, 4—6 pdr., 2—1 pdr., 2 M. 3—14 inch tubes (*above water*). Deck 1½″. Conning tower 2″. Designed H.P. 6550 = 17·5 kts. Coal 600 tons.

ITALIAN TORPEDO GUNBOATS. (Mostly fitted as **Mine Layers.**)



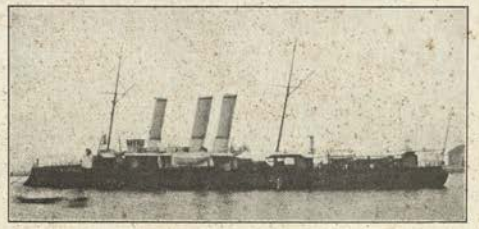
AGORDAT (1899) & **COATIT** (1899). 1313 tons. Complement 154. Dimensions: 287½ × 30½ × 10¼ feet. Armament: 12—12 pdr., 2—18 inch tubes (*above water*). Deck, ¾″. Designed H.P. 8000 = 23 kts. Blechynden boilers. Coal: *normal* 180 tons; *maximum* 270 + oil.



MINERVA (1892). 846 tons. Comp. 105. Length, 246 feet. Beam, 27 feet. *Max.* draught, 12½ feet. Guns: 2—12 pdr., 4—6 pdr., 3—1 pdr. Torpedo tubes: 6 *above water*. Armour: 1½″ deck. Designed H.P. 4200 = 22 kts. Blechynden boilers. Coal: *normal* 120; *max.* 180 tons. *Mine layers.*

PARTENOPE (1889). 834 tons. Guns: 2—12 pdr., 4—6 pdr. Sister to above.

IRIDE (1891). 916 tons. Sister to above. *Photo, Spartali*



MONTEBELLO (1887). 860 tons. Comp. 105. Guns: 4—6 pdr. Torpedo tubes: 3 *above water*. Armour: 1½″ deck. Designed H.P. 3600 = 20 kts. Boilers: Blechynden, Yarrow, etc. (fitted for training). Coal: *normal* 110 tons; *max.* 130 tons. *Mine layer.*

GOITO (1887). 840 tons. Guns: 6—6 pdr. 3 tubes. Deck 1½″. Designed H.P. 3600 = 20 kts. Locomotive boilers. *Mine layer.*

TRIPOLI (1886) (1898) sister to above: fitted with Belleville boilers, and burning oil fuel. *Mine layer.*

33 + 16 ITALIAN DESTROYERS (*Cacciatorpediniere*).

Total	Type.	Date.	Displacement.	H.P.	*Max.* Speed.	Coal or Oil.	Complement.	Tubes.	*Max.* Draught.
			tons.		kts.	tons.			feet.
3	*C. Mirabello* (A)	'14—'16	1500	—	32	—	—	—	—
3	*A. Poerio* (A)	'14—'16	1028	—	—	—	—	—	—
6	*R. Pilo* (Od)	'13—'15	770	—	—	—	—	—	—
4	*F. Nullo* (P) (T)								
2	*Ardito* (Or)	'13	686	—	—	—	—	—	—
2	*Animoso* (Or)	'11—'13	700	14,000	30	—	—	—	—
6	*Indomito* (P) (T)	'13	686	—	—	—	—	—	—
1	*Ascaro* (A)	1912	308	6000	29	80	—	3	—
6	*Artigliere* (A)	'08—'10	380	6000	28·5	80	56	3	$8\frac{3}{4}$
4		'06—'07							
6	*Nembo* (P)	'01—'03	330	6000	30	75	53	4	$7\frac{1}{2}$
5	*Lampo* (S)	'98—'02	320	6000	30	80	53	2	$8\frac{2}{3}$
1	*Fulmine* (A)	'97—'99	298	4800	28	60	43	3	9

(A)=Ansaldo. (Od)=Odero. (Or)=Orlando. (P)=Pattison. (S)=Schichau. (T)=Thornycroft design.

Building.

3 *Ansaldo* boats. **C. Mirabello, C. A. Racchia, A. Riboty.** 1500 tons. 32 knots.

Building.

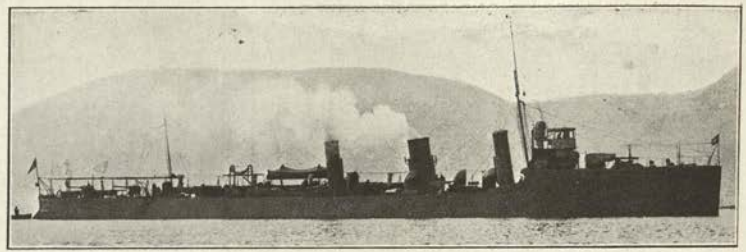
3 *Ansaldo*: **A. Poerio, C. Rossardi, G. Pepe.** 1028 tons. Dimensions: 279×26¼×9¼ feet.

Building.

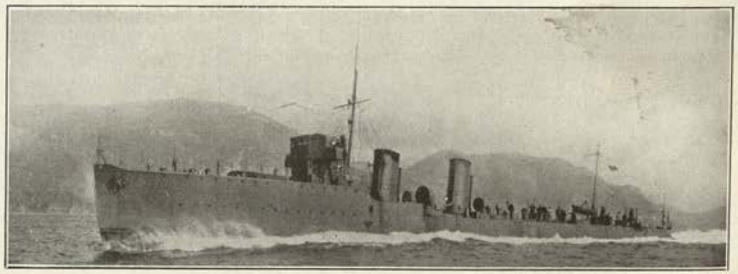
6 *Odero*: **R. Pilo, G. Abba, I. Nievo, S. Schiaffino, P. Bronzetti, G. Missori.** 770 tons. Dimensions: 239½×24×8¼ feet.

Building.

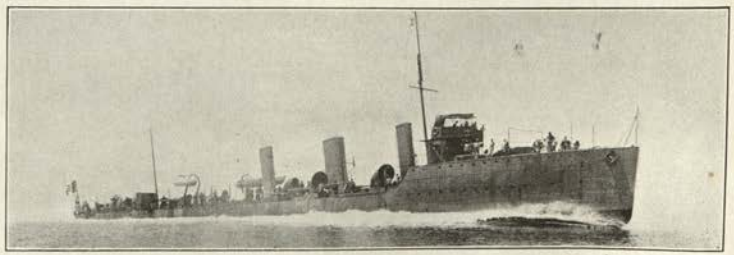
4 *Pattison (Thornycroft design)*: **F. Nullo, A. Mosto, G. Sirtori, G. Carini.** 770 tons. Dimensions: 239½×24×8¼ feet.



2 *Orlando*: **Ardito, Ardente,** (1912) 690 tons. Armament: 1—4·7, 4—12 pdr. 2—18 inch tubes. Dimensions: 239½×24×8¼ feet.

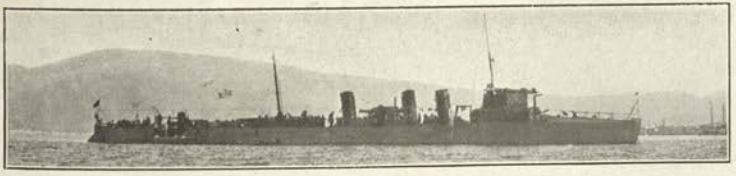


2 *Orlando*: **Animoso, Audace.** 700 tons. Zoelly turbines. Armament: 1—4·7, 4—12 pdr., 2—18 inch tubes. Dimensions: 249½×24½×7¼ feet.



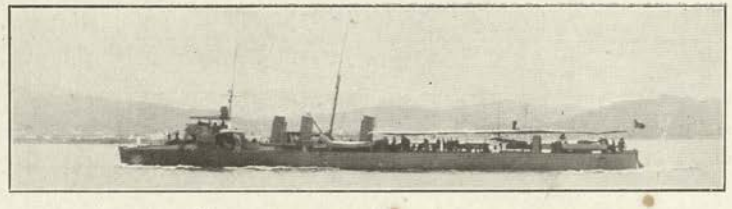
6 *Pattison*: **Indomito, Impavido, Impetuoso, Insidioso, Intrepido, Irrequieto.** 686 tons. Tosi turbines. Armament: 1—4·7 inch, 4—12 pdr., 2—18 inch tubes. Dimensions: 240×24×8¼ feet.

1 *Ansaldo*: ***Ascaro*** (1912). 398 tons. Dimensions: 213×20×6¼ ft.

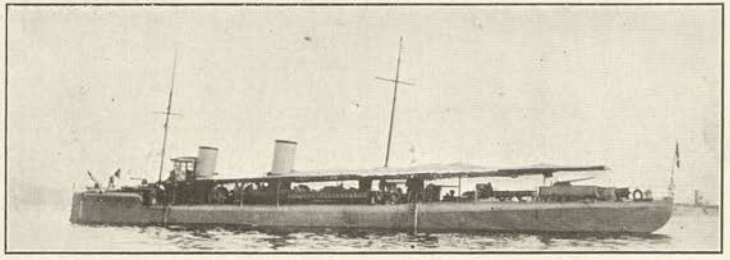


Photo, Spartali.

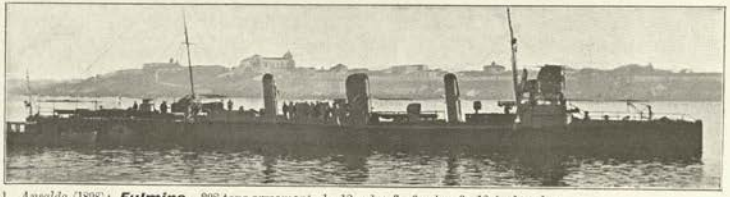
10 *Ansaldo* named:—***Artigliere*** (1907), ***Alpino*** (1909), ***Corazziere*** (1909), ***Fuciliere*** (1909), ***Granatiere*** (1907), ***Lanciere*** (1907), ***Bersagliere*** (1907), ***Pontieri*** (1910), ***Carabiniere*** (1909), and ***Garibaldino*** (1909). Armament: 4—12 pdr., 3—18 inch tubes. 2 searchlights. Wireless fitted. Boilers: Thornycroft.



The 6 *Nembo* (Thornycroft pattern):—***Aquilone, Borea, Espero, Nembo, Turbine, Zeffiro.*** (Carry 5—6 pdr.) 4 tubes, 18 inch. 1 Searchlight. Wireless fitted. Boilers: Thornycroft.



5 *Schichau*:—***Dardo, Euro, Lampo, Strale, Ostro.*** 320 tons Armament. 1—12 pdr., 5—6 pdr. 2—18 inch tubes.



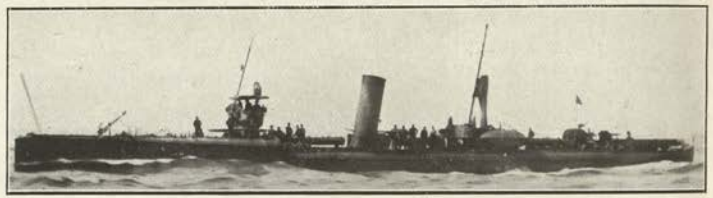
1 *Ansaldo* (1898): ***Fulmine.*** 298 tons armament. 1—12 pdr., 3—6 pdr. 3—18 inch tubes

60 sea-going, **5** first class, **14** second class, **6** third class (total **85**) ITALIAN TORPEDO BOATS.

No.	Type.	Date.	Displacement.	H.P.	*Max.* Speed.	Fuel.	Complement.	Tubes.	*Max.* Draug't
	Seagoing—		tons.		kts.	tons.			feet.
2	32—31 (A.S.)	...	...	...	..	...	...	...	...
6	30—25 (A.S.)								
12	24—13 (O.S.)	'10-'12	120	...	...	...	...	..	..
12	12—1 (P.N.)								
6	*Saffo* (S)	'05-'07	215	3000	25·5		34	3	8
6	*Airone* (O.S.)								
8	*Cigno* (P.N.)	'05-'07	220	2900	26	40	34	3	8
4	*Pegaso* (P.N.)								
4	*Orsa* (O)								
	First class—								
1	*Gabbiano*	'06-'07	162	2200	22½			3	
1	*Pellicano* (O.S.)	1898	147	2700	23	40	28	2	8
1	*Condore* (A.S.)	1898	136	2400	25·7	40	28	2	8
2	*Aquila* (S)	1888	140	2200	23·1	40	23	3	8
	Second class—								
14	128—68 (S)	'90-'95 '86-'89	79	1000	20	17	17	2	7
	Third class—								
6	56—29 (T)	'87-'82	39	430	21	7	11	2	6½

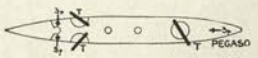
(A.S.)= Ansaldo. (O.S.)= Odero. (P.N.)= Pattison. (S)= Schichau. (Y)= Yarrow.
The (O) and (P) seagoing boats are from Thornycroft designs.

30–25 A.S. 24–13 O.S. 12–1 P.N.

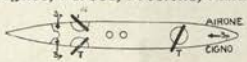


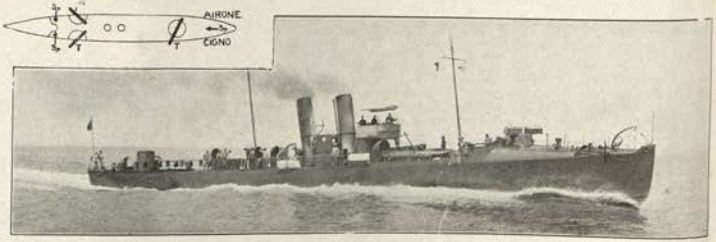
Photo, Civicchioni.

6 *Saffo* class (Schichau): ***Saffo, Serpente, Sagittario, Scorpione, Sirio, Spica.*** One searchlight. Armament: 3—3 pdr., 3—18 inch tubes.



Pegaso, Perseo, Procione, Pallade.

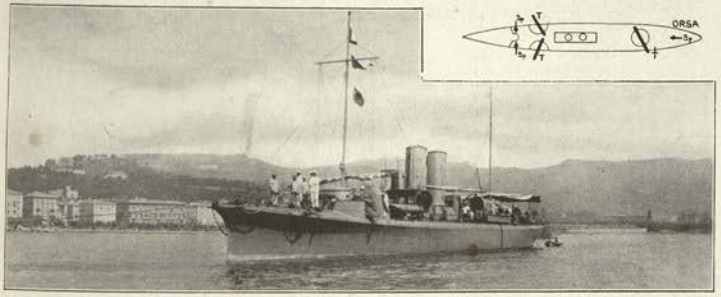




6 *Airone* class: ***Airone, Alcione, Ardea, Albatros, Astore, Arpia.*** 3—3 pdr., 3—18 inch tubes.

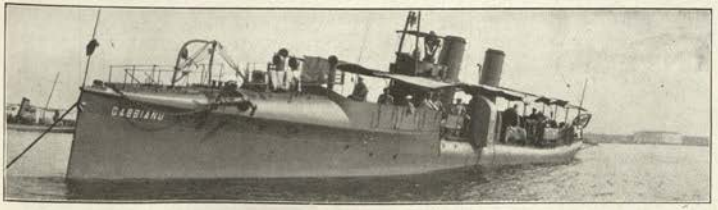
[*Continued on next page.*

8 *Cigno* class: ***Cigno, Clio, Canopo, Centauro, Cassiopea, Calliope, Calipso, Climene.***



Photo, Civicchioni.

4 *Orsa* class: ***Orsa, Orione, Orfeo, Olimpia.*** 3—3 pdr., 3—18 inch tubes. 1 searchlight.

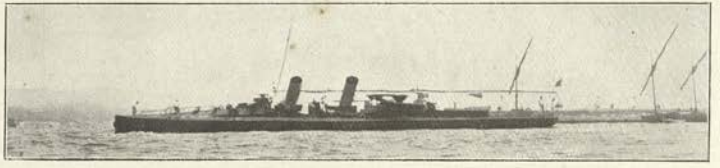


Gabbiano. 2—3 pdr. 3 tubes.

Pellicano and ***Condore.*** 3—3 pdr., 2—18 inch tubes. *Photo, Civicchioni.*

Photo, Civicchioni.

2 Boats. *Aquila* class (Schichau type). ***Avvoltoio, Sparviero.*** Armament: 2—1 pdr., 2—18 inch tubes.



14 *Schichau* type: ***128, 115, 114, 113, 105, 104, 102, 101, 98, 88, 82, 68.*** Armament: 2—1 pdr., 2—14 inch tubes. *(Several have been re-boilered.)*

There still exist 6 *old Thornycroft:* ***56, 43, 39, 29, 31, 38.***

Submarine Flotilla (*Battelli Sottomarini*)

No.	Class.	Date.	Displacement.	Motive Power, above.	H.P.	*Max.* Speed.	Dimensions, in feet.	Tubes.	*Max.* radius, in miles.
6	*New*	...			...		...	...	...
2	*New* (F).....	...			...		...	...	...
8	*Argo*	'11-'13	250 / 300	Heavy Oil	...	18 / 14	...	2	1200
2	*G. Pullino* (C)	'11-'12	396		...	13 / 9	...	2	...
1	*Atropo* (G)	1912		Heavy Oil	260		...	2	...
2	*Nautilus* (B)	'11-'13	225 / 299		750 / 260	15 / 9	148×15	2	...
1	*Foca* (F)	1907	180 / 230	Benzine	750 / 360	13 / 7	138×10½×14½	2	875 at 8 kts.
5	*Glauco*	'03-'06	150	Benzine 4 cyl.	600 / ...	13 / 7	118×10×14½	2	500 at 10 kts.
1	*Delfino*	1890	95 / 107	Benzine (1902)	150 / ...	9 / 6	78½×9½×9½	1	30

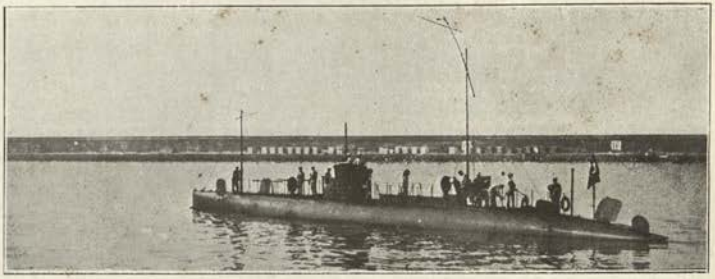
B = Bernardi. C = Cavallini. F = Fiat San-Giorgio Laurenti type. G = Germania.

6 new large submarines, named: ***P. Micca, Galvani, Toricelli*** (*building* at Spezia), ***L. Mocenigo, L. Marcello, A. Emo*** (at Venice).

2 *G. Pullino* class, named: ***G. Ferraris, G. Pullino.***

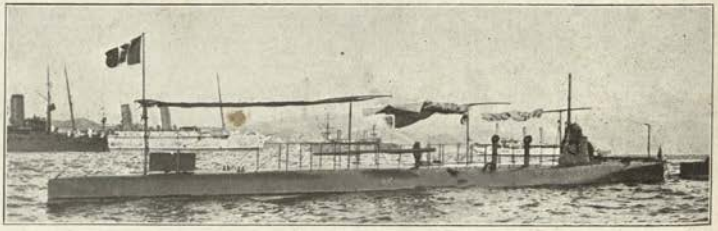
Atropo. Diesel-Rohöl Motors

2 *Nautilus* class, named: ***Nautilus, Nereide.***



8 *Argo* class, named: ***Argo, Fisalia, Jalea, Janita, Medusa, Salpa, Velella, Zoea.*** All have Diesel motors and Siemens-Schuckert electrical ditto. Complements, 14.

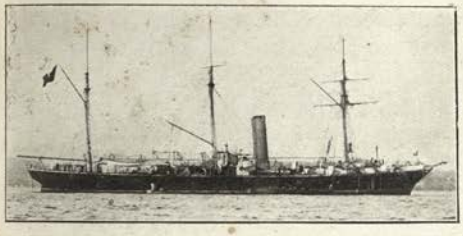
Foca. Fiat motors. 2 periscopes. 8 w.t. compartments.



Glauco class, named ***Glauco, Squalo, Narvalo, Tricheco, Otaria.*** (These two last have 600 H.P. Thornycroft engine.)

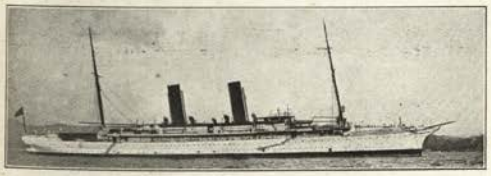
Delfino.

Surveying Service.



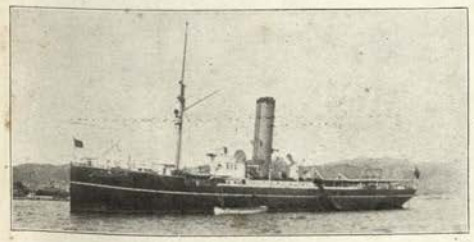
STAFFETTA (1876). 1800 tons. Armament: 4–6 pdr. H.P. 1700=14 kts. Coal: 420 tons.

Royal Yacht.



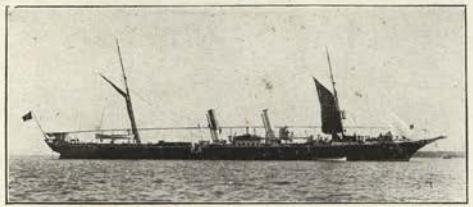
TRINACRIA (*ex America*), 1884. 9207 tons. Dimensions: 441½×51½×27 feet. Armament: 4–6 pdr., 4–1 pdr., 2–12 pdr. boat guns. Torpedo tube and torpedo boats carried. Designed H.P. 6000=18·5 kts.

Despatch Vessels.

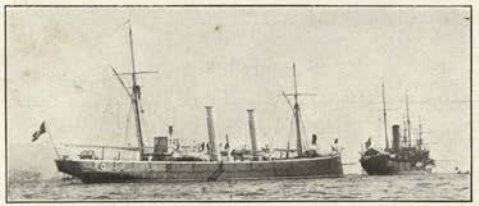


CICLOPE (1903). 844 tons. 177×29½×12 feet. Armament: 2–6 pdr., 2–1 pdr. H.P. 2298=15 kts. Coal: 170 tons.

Despatch Vessels.

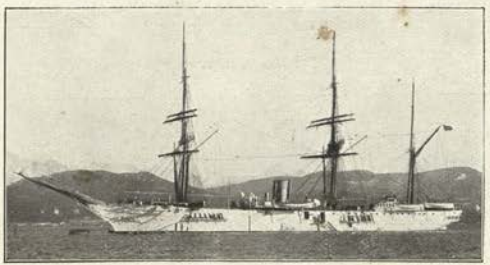


GALILEO (1887). 970 tons. Armament: 4–4·7 in., 2–6 pdr., 2 machine. H.P. 1400=15 kts. Coal: 220 tons.



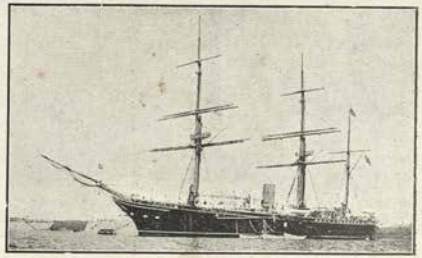
BARBARIGO (1879) and M. A. COLONNA (1879). 624 tons. Armament: 5–6 pdr., 2 machine. H.P. 1700=15 kts. Coal: 200 tons.

Old Cruisers.



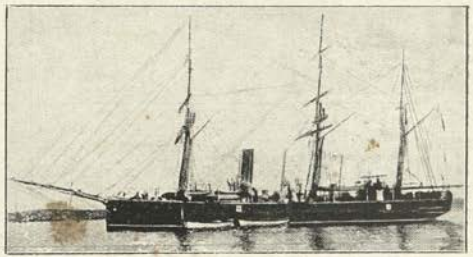
VESPUCCI (1882). 2705 tons. Armament: 4–4·7 in., 4–6 pdr., 4–1 pdr., 2 machine, 2 torpedo tubes. Armour: 4" deck amidships. H.P. 3440=14 kts. Coal: 500 tons + oil fuel.

Old Cruisers.



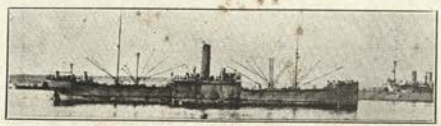
FLAVIO GIOIA (1881). 3064 tons. Armament: 2–4·7 in., 4–6 pdr., 4–1 pdr., 2 machine. 2–14 in. torpedo tubes. Armour: 1½" deck amidships. Designed H.P. 4000=15 kts. Coal: 500 tons and oil fuel.
(*Navigation School*).

Gun Boats.



CURTATONE (1888). 1156 tons. Armament: 4–6 pdr. Designed H.P. 1100=11·5 kts Coal: 200 tons.

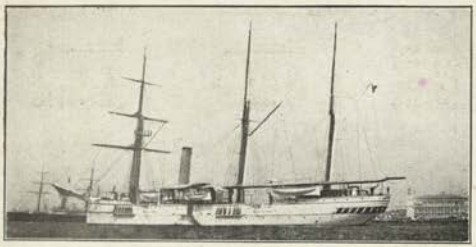
Fleet Colliers.



BRONTE and STEROPE. 9460 tons. Speed: 13 kts. Carry 6000 tons coal and 4000 tons oil. Fitted with Temperleys.

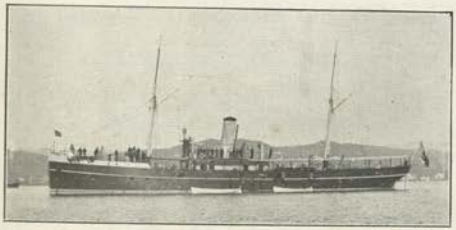
ITALIAN AUXILIARIES.

Gun Boats.



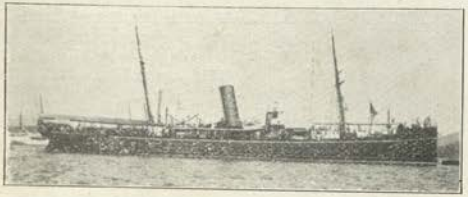
VOLTURNO (1887). 1156 tons. Armament: 4—4·7 in., 4—6 pdr., 2—1 pdr., 2 machine. Designed H.P. 1100=11·7 kts. Coal: 200 tons.

Special Tugs.



ATLANTE (1892) & ERCOLE (1892). 776 tons. Armament: 2–6 pdr., 2–1 pdr. Designed H.P. 1700=13 kts.

Mining Ship.



VOLTA (1883). 2180 tons. Armament: 5–6 pdrs. Designed H.P. 2500=11 kts. Coal: 460 tons.

Tanks.

TEVERE (1897). ERIDANO, VERBANO, TITANO. 960 tons. Armament: 2—1 pdr. Designed H.P. 580=9 kts.

VERDE & PAGANO (1877). 390 tons. Armament: 2—1 pdr. Original speed: 9 kts.

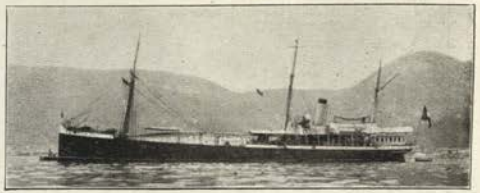
Miscellaneous.

DERMA.

Cable Ship.

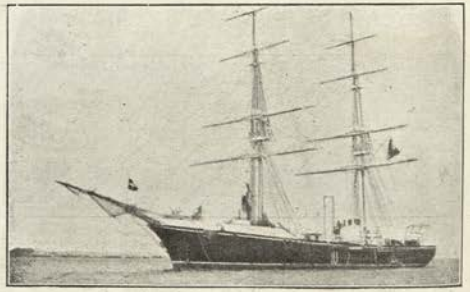
CITTA DI MILANO (1886). 2123 tons. Armament: 2—6 pdr., 2—1 pdr. Original speed: 9 kts.

Transport.



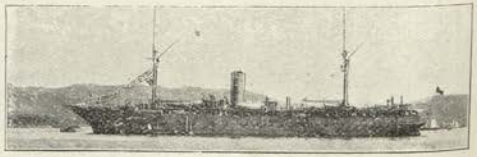
GARIGLIANO (1887). 935 tons. Armament: 2—1 pdr. Speed: 9 kts.

Training Ships.



MISENO (1886), PALINURO (1886). Both *about* 540 tons. Armament: 2–6 pdr. Speed: *about* 10·9 kts.

Repair Ship.

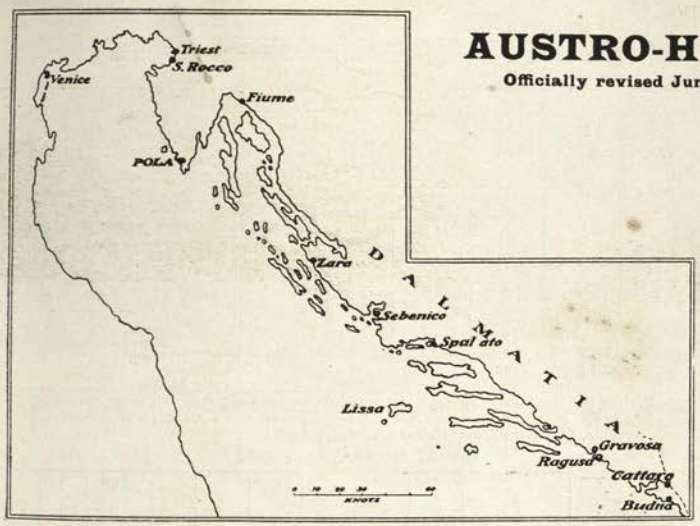


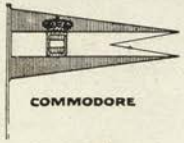
VULCANO (*ex Savoia*), (1885). 2850 tons. Speed: 11·5 kts.

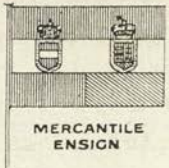
There are also about 26 tugs, 810-85 tons, and 13 tank vessels.

AUSTRO-HUNGARIAN FLEET.

Officially revised June, 1914 by order of the Minister of Marine.







UNIFORMS, INSIGNIA OF RANK.

	Admiral.	Vize-Admiral.	Kontre-Admiral.	Linienschiffs Kapitän.	Fregatten Kapitän.	Korvetten Kapitän.	Linienschiffs-Leutenant.	Fregatten-Leutenant.	See Fahnrich.	See Kadet.
Corresponding British or U.S.	*Rear-Admiral.*			*Captain.*		*Commander.*	*Lieutenant 2½ Lieut. Comdr.*	*Lieutenant.*	*Sub-Lieut.*	*Midshipman.*

The men wear a French style of cap, with *K. ü K. Kriegs Marine* on the ribbon.

Civilian branches: without curl.

Naval Constructors	...	red between stripes.
Doctors	... ...	black „ „
Paymasters	... ...	blue.
Engineers	... ...	light grey.

Private Yards.

TRIEST. Stabilimento Tecnico, Triestino. Frontage 2100 feet. Area 123,000 sq. yards. Plant: 1 steam, electric 1,250 H.P., 1 Diesel-electric, 500 H.P., 2 Diesel-pneumatic, 500 H.P. One patent slip. 200 feet lift, 450 tons. Employees 2500. One floating dock 183×68. All kinds of warships and merchant ships built here. Engine works: San Andrea.

CANTIERE NAVALE TRIESTINO, Monfalcone, bei Triest. Area about 500,000 sq. feet (46,000 m².) 9 slips (taking ships up to 600 feet). Electric H.P., 950 h.p. 2 small floating docks. Employees 2500. Output for 1913, 32,536 tons gross.

FIUME. Whitehead torpedo factory.
Danubius Co. (subsidised by Hungarian Govt.)

Mercantile Marine.

Austrian.—382 steamers of 391,000 tons, about 1,550 sailing ships (mostly coasters), and 24,000 fishing boats, etc.

Hungarian.—128 steamers of 132,000 tons, about 180 sailing ships, and 200 fishing boats.

Personnel: Nearly 20,000, all ranks.

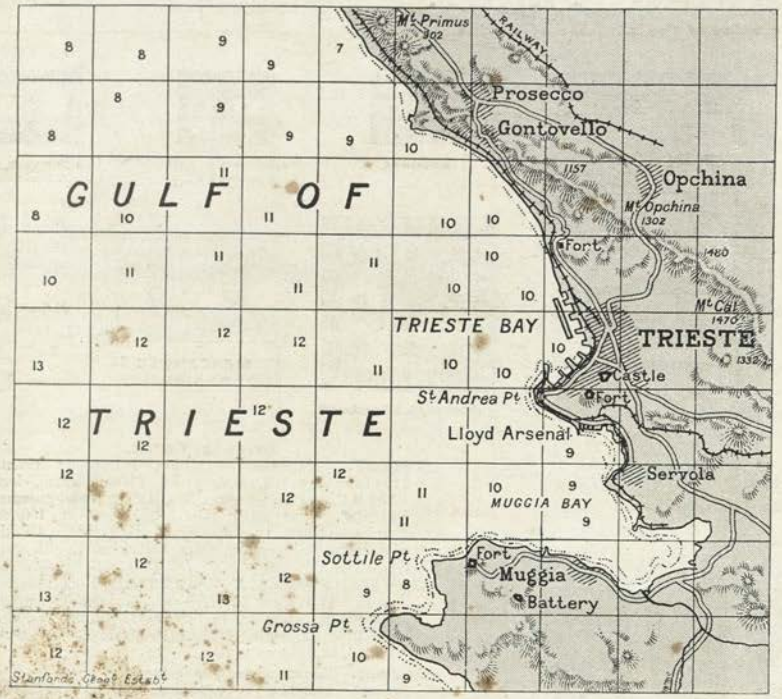
Principal Mercantile Ports.

TRIEST, FIUME.

Coinage (new).

One krone (100 heller) = { 10*d.* British. / 20 cents U.S.A.

The old coinage piece the *kreuzer* = 2 heller, and the florin = 2 kronen. Gold coins are the 20 kronen (= 16/8 British, 4 dollars U.S.A.), the 10 kronen, and the ducat (9/4½ English).



Arsenals.

TRIEST. No Government docks. 1 slip. (Austrian Lloyds have a dock here $423 \times 68 \times 19$ feet; and there is a dock at San Rocco, across the bay, $414 \times 66 \times 21$ feet).

Admiralty Chart No. 1434. Rise of Spring Tide, 2 feet.

Torpedo Stations.

POLA, LUSSIN, ZARA, CATTARO, SEBENICO.

Coaling Stations.

POLA; GRAVOSA (Ragusa), TEODO.

Dreadnought Docks.

1 floating, Pola.

POLA. Two dry docks: (*a*) $467 \times 85 \times 27\frac{3}{4}$ feet and (*b*) $397 \times 86 \times 31\frac{1}{8}$ feet; also one small floating dock. Employés vary from 2000 to 4000. 3 slips. Naval hospital.

Admiralty Chart No. 202. Rise of Spring Tide, $3\frac{1}{2}$ feet.

Besides the small floating dock mentioned (for torpedo craft only), there are two other floating docks here. Dimensions: $459\frac{1}{2} \times 90\frac{1}{2} \times 32\frac{1}{2}$ feet, and $300 \times 82\frac{3}{4} \times 20$ feet. Also new large 22,000 ton dock, and 40,000 ton floating dock *building*.

Naval Guns. (Krupp Model.)

Notation.	Designation.		Length in Calibres.	Model.	Weight.	Weight, A.P. Shot.	Initial Velocity.	*Maximum* penetration A.P. capped against K.C. at impact.			Rounds per minute.
								8000 yds.	5000 yds.	3000 yds.	
	c/m.	in.			tons.	lbs.	ft. secs.	in.	in.	in.	
A^5	*30·5*	12	45	new	$54\frac{1}{2}$	992	2623	$11\frac{1}{2}$	$18\frac{1}{2}$	24	...
AA	*24*	9·4	40-45	1901	25	474	2441	5	9	$11\frac{5}{8}$	2
A	*24*	9·4	40	1894	28	474	2264	3	$7\frac{1}{16}$	$10\frac{1}{2}$	2
B	*24*	9·4	35	1886	27	474	2100		5	$7\frac{1}{16}$	·6
A	*19*	7·6	40	1901	...	...	2500		$5\frac{3}{4}$	$8\frac{1}{4}$	3-4
	15	6	40	1901	...	...	2500		$2\frac{1}{16}$	4	...
	15	6	40	1894	$44\frac{1}{2}$	100	2297		$2\frac{1}{16}$	3	5-8
	15	6	35	1886	5	112	1960		$1\frac{1}{4}$	$2\frac{1}{2}$	...
	12	4·7	40	...	...	...	2297		...	...	7
	7·5	2·9	...	...	...	12	2379		...	...	...

A burster "Ammonal" (made from aluminium), is used for all shell.

Navy.

Personnel: *about* 20,000 all ranks (conscript).
Colour of Ships: Light grey.
Torpedo used: Whitehead.
Chief Constructor: Herr F. Popper.
Commander-in-Chief: Admiral A. Haus.

A cone.

AUSTRO-HUNGARIAN WARSHIPS IDENTIFICATION AND SIGNAL SILHOUETTES. (*strictly copyright.*)

Ships whose names are not in capitals and to which no signal letter is assigned are harbour and subsidiary service.

A cone.

BC WIEN *class*

SPLATATO.

GIGANT.

CB METEOR.

PLANET.

CE TRABANT

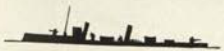
Blitz & Komet.

Sebenico & Zara.

Lussin.

Pelikan.

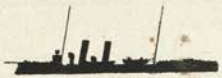
Cyclop.



GB MAGNET.

K. E. RUDOLF.

MARS.



LAKROMA.

HG LEOPARD *class* (2 ships).

HI K. F. JOSEF *class.*

HJ ZENTA *class.*

IG K ü K MARIA THERESIA.

IH HABSBURG *class* (3 ships).

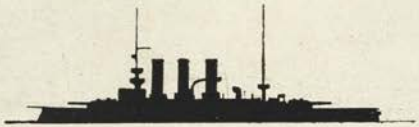
J VIRIBUS UNITIS *class.*

JG E. F. FERDINAND *class* (3 ships).

MIRAMAR.

THREE FUNNELS.

NG KAISER KARL VI.



NH ERZHERZOG KARL *class* (3 ships).

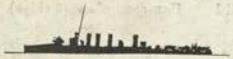
NI ST. GEORG.

OG GAEA (*repair ship*).

PB SATELLIT.

SG ADMIRAL SPAUN.

AT cone. TORPEDO CRAFT.



S Destroyers.

G Latest t.b. **H** Earlier t.b.

(V. Unitis Class—4 Ships).

VIRIBUS UNITIS (June, 1911), TEGETTHOF (March, 1912), P. EUGEN (Nov., 1912), SZENT ISTVAN (1914).

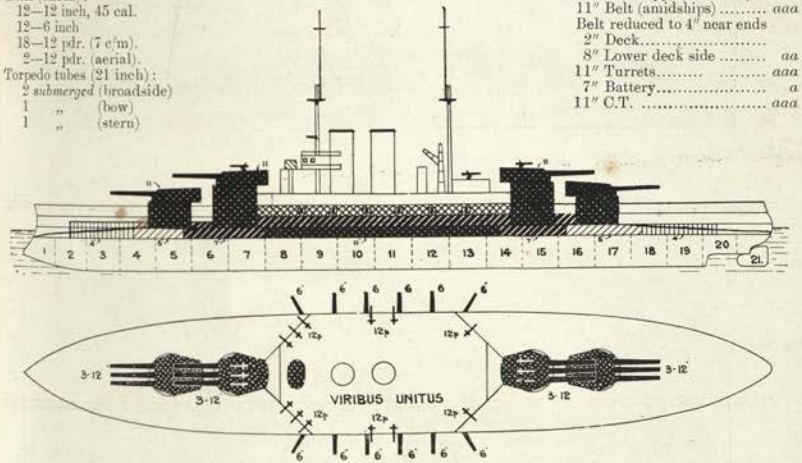
Displacement, 20,000 tons. *Full load*, 22,000 tons. Complement, 1000.

Length (*p.p.*), 469 feet. Beam, 89½ feet. *Mean* draught, 27 feet. Length *over all*, 500 feet.

Guns (Skoda):
12—12 inch, 45 cal.
12—6 inch
18—12 pdr. (7 c/m).
2—12 pdr. (aerial).

Torpedo tubes (21 inch):
2 *submerged* (broadside)
1 „ (bow)
1 „ (stern)

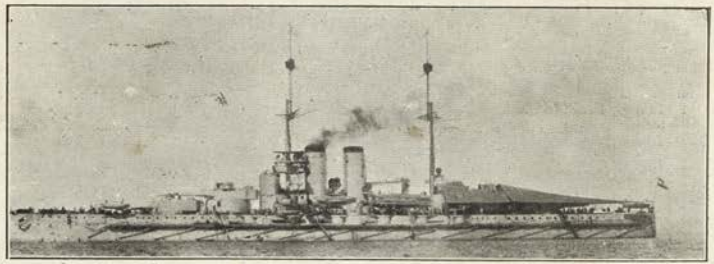
Armour (Krupp) (*see Notes*):
11″ Belt (amidships) ..... *aaa*
Belt reduced to 4″ near ends
2″ Deck.....
8″ Lower deck side ..... *aa*
11″ Turrets..... ..... *aaa*
7″ Battery..... *a*
11″ C.T. ..... *aaa*



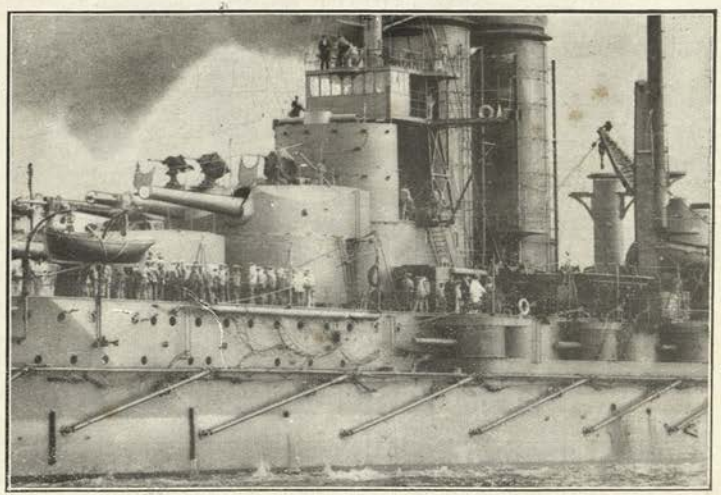
Machinery: Turbine, see *Notes*. 4 screws. Boilers: see *Notes*. Designed H.P. 25,000 = 21 kts. Coal: *normal* 900 tons; *maximum* 2000 tons (+ oil: tons).

Torpedo Notes.—Bullivant net defence,

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Boilers*	*Best recent speed*
V. Unitis	Stab. Tecnico	Stab. Tecnico	July, '10	*To be* Sept., '12	≈21·8	Parsons	Yarrow	
Tegetthof	Stab. Tecnico	Stab. Tecnico	May, '10	Mar., '13		Parsons	Yarrow	
P. Eugen	Stab. Tecnico	Stab. Tecnico	Mar., '11	June, '14		Parsons	Yarrow	
Szent Istvan	Fiume	Danubius	Mar., '11	'15		A.E.G. (Curt.)	Babcock	



Viribus Unitis (1914). *Photo, Spartali.*



Details. Viribus Unitis.

(Radetzky Class—3 Ships).

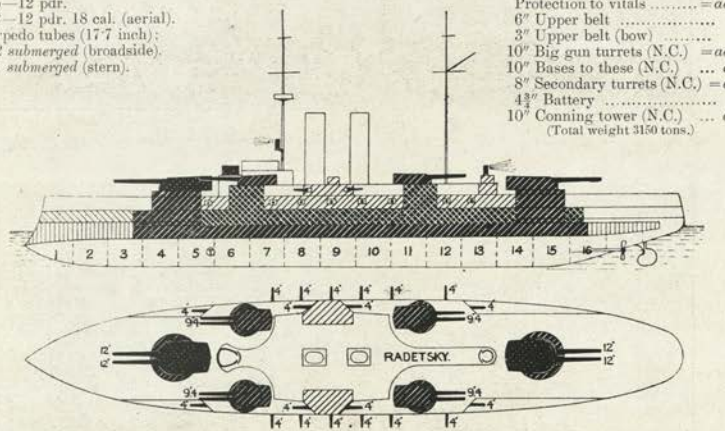
ERZHERZOG FRANZ FERDINAND (Sept., 1908), **ZRINYI** (April, 1910), *and* **RADETZKY** (July, 1909).

Displacement, 14,500 tons. Complement, 880.

Length (*waterline*), 448 feet. Beam, 82 feet. *Mean* draught, 26½ feet. Length *over all*, 456 feet (*p.p.* 429¾).

Guns (Skoda):
4—12 inch, 45 cal. (A^3).
8—9·4 inch, 45 cal. (A^3).
20—4·1 inch, 50 cal.
6—12 pdr.
2—12 pdr. 18 cal. (aerial).
Torpedo tubes (17·7 inch):
2 *submerged* (broadside).
1 *submerged* (stern).

Armour (Krupp):
9″ Belt (amidships) ..... *aa*
4″ Belt (ends) ..... *d*
2″ Deck on slopes .....
Protection to vitals ..... = *aaa*
6″ Upper belt ..... *a*
3″ Upper belt (bow) ..... *e*
10″ Big gun turrets (N.C.) = *aaa*
10″ Bases to these (N.C.) ... *aa*
8″ Secondary turrets (N.C.) = *aa*
4·3″ Battery ..... *e*
10″ Conning tower (N.C.) ... *aa*
(Total weight 3150 tons.)



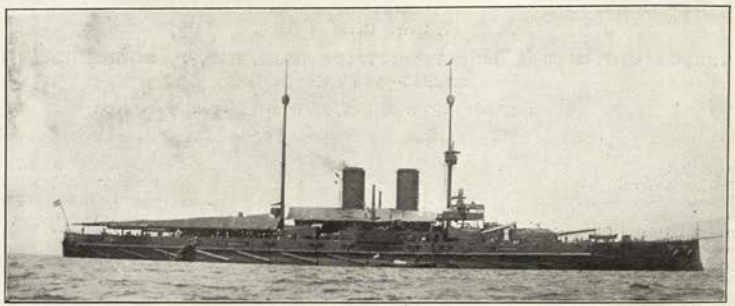
Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: Yarrow. Designed H.P. 20,000 = 20 kts. Coal: *normal* 750 tons; *maximum* 1350 tons.

Armour Notes.—Main belt is 285½ feet long by 7½ feet deep, 5 feet of it below water. 6″ bulkheads. Upper belt same length. Battery, etc., 180 feet long.

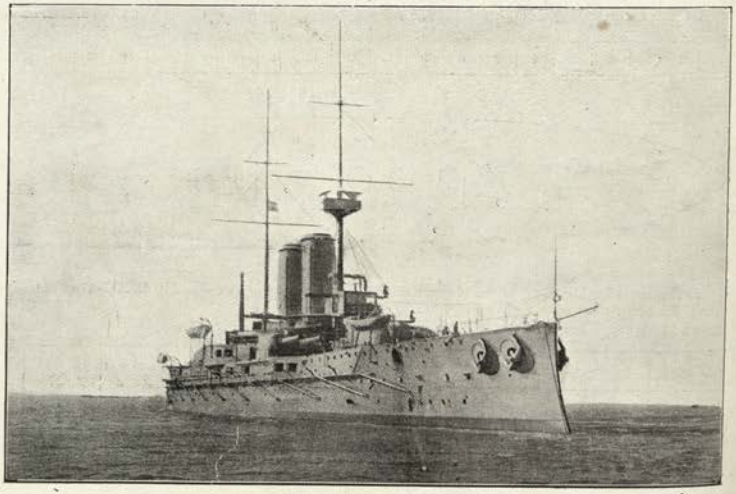
Gunnery Notes.—Big guns have arcs of fire 290°. Bow ones 29½ feet above normal water line, after, 26 feet. Manœuvred electrically. 9·4 average 24½ feet above water. Battery guns 16 feet above water. These have arcs of fire 130°—100°. The 12 inch are extremely powerful guns, but the 9·4's are not a new model.

Torpedo Notes.—Net defence fitted (Bullivant).

Name.	*Built and engined at.*	*Laid down.*	*Completed.*	*Trials.*	*Boilers.*	*Best recent speed.*
Erz. F. Ferdinand	All at Stabilimento Tecnico	Sept., '07	1910	20,600 = 20·58	Yarrow in all	
Zrinyi		Sept., '08	1911			
Radetzky		Dec., '07	1911			



E. F. Ferdinand. *Photo, Spartali.*



1901 AUSTRO-HUNGARIAN BATTLESHIPS (20 knot).

(E. Karl Class—3 Ships).

ERZHERZOG KARL (Oct., 1903), **ERZHERZOG FRIEDRICH** (April, 1904), and **ERZHERZOG FERDINAND MAX** (May, 1905).

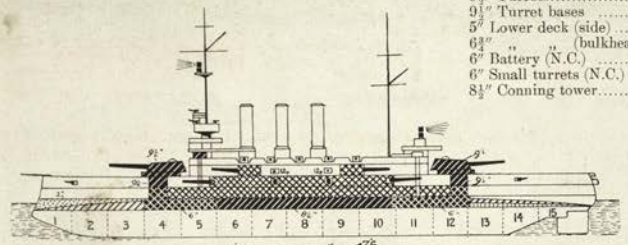
Displacement, 10,600 tons. Complement, 700.

Length (*waterline*), 408 feet. Beam, 72 feet. *Mean* draught, 24½ feet. Length (*p.p.*), 390½ feet.

Guns (Skoda):
4—9·4 inch, 40 cal.
12—7·6 inch, 42 cal.
12—12 pdr. 45 cal.
2—12 pdr. 18 cal. (*AA*).
Torpedo tubes (17·7 inch):
2 *submerged*.

Armour (Krupp):

8½″—6″ Belt (amidships)	*aa-a*
9″ Bulkheads	*aa*
2″ Belt (bow)	*f*
2″ Deck (flat on belt)	
2¾″ Deck (at ends)	=*e*
Protection to vitals is	*aa*
9½″ Barbettes	*aa*
9½″ Turrets	*aa*
9½″ Turret bases	*aa*
5″ Lower deck (side)	*b*
6¾″ ,, ,, (bulkhead)	*a*
6″ Battery (N.C.)	*b*
6″ Small turrets (N.C.)	*b*
8½″ Conning tower	



Ahead:
2—9·4 in.
4—7·6 in.

Astern:
2—9·4 in.
4—7·6 in.

Broadside: 4—9·4 in., 6—7·6 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 12 Yarrow. Designed H.P. *n.d.* 14,000 = 19·25 kts., *f.d.* 18,000 = 20·25 kts. Coal: *normal* 550 tons; *maximum* 1315 tons.

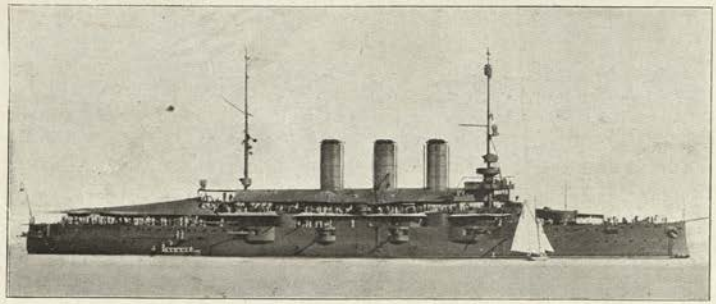
Armour Notes.—Belt is 8¼ feet wide by 225 feet long; 3½ feet of it below waterline; lower edge is about 6″ thick.

Gunnery Notes.—Loading positions, big guns: all round. Hoists, electric. Big guns manœuvred electrically; secondary guns electrically. Big guns with 20° elevation have a range of 17,000 yards.
Arcs of fire: Big guns, 260°.
Height of guns above water: Bow turret, 20½ feet. After turret, 20 feet. Main deck battery, 13 feet.

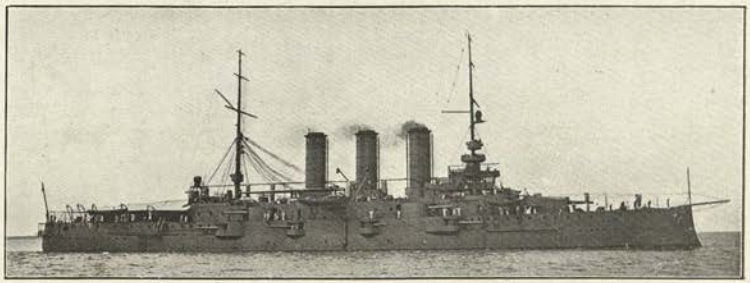
Torpedo Notes.—6 searchlights.

Engineering Notes.—On the average 126 revs. = 19 kts.; 128 = 19·5 kts.; 138 = 20·5 kts.

General Notes.—The double bottom extends 240 feet amidships only. Average cost per ship £912,500.



Erzherzog Karl.



Small fire controls now fitted high up on foremast of each.

Name.	*Builder.*	*Machinery.*	*Laid down*	*Completed*	*Last refit*	*Trials: n.d.*	*f.d.*	*Boilers.*	*Recent best speed.*
E. Karl	Triest	All by	1901	Feb.'05		13,180 = 19·16	17,926 = 20·56	Yarrow	
E. Friedrich	Triest	Stabilimento	1902	Oct.'06		14,100 = 19·01	18,130 = 20·57	in	
E. Ferdinand Max	Triest	Tecnico	1903	Apr.'07		14,390 = 19·57	18,600 = 20·76	all.	

HABSBURG (Sept., 1900), **ARPAD** (Sept., 1901), **BABENBERG** (Oct., 1902).

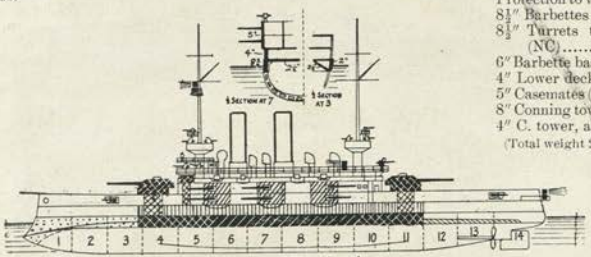
Displacement, 8340 tons. Complement, 880.

Length (*p.p.*), 354½ feet. Beam, 65½ feet. *Maximum* draught, 25 feet. Length (*w.l.*), 408 feet.

Guns:
3—9·4 inch, 40 cal. (*A*).
12—6 inch, 40 cal.
10—12 pdr.
2—12 pdr. 18 cal.

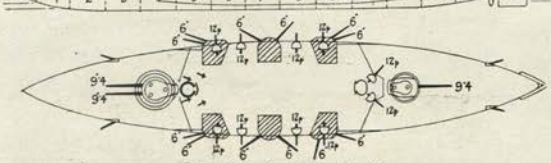
Torpedo tubes (17·7 inch.):
2 *submerged*.

Armour (Krupp):
8¾″ Belt (amidships)... *aa*
2″ Belt (bow) (N.C.) ... *f*
2½″ Armour deck (flat amidships)
8″ Bulkheads ..... *aa*
Protection to vitals is... *aa*
8½″ Barbettes (N.C.)... *aa*
8½″ Turrets to these (NC).....*aa-a*
6″ Barbette bases (N.C.) *a-b*
4″ Lower deck side ... *d*
5″ Casemates (12) (N.C.) *c*
8″ Conning tower (N.C.) *a*
4″ C. tower, aft ... ... *d*
(Total weight 2250 tons).



Ahead:
2—9·4 in.
4—6 in.

Astern:
1—9·4 in.
4—6 in.

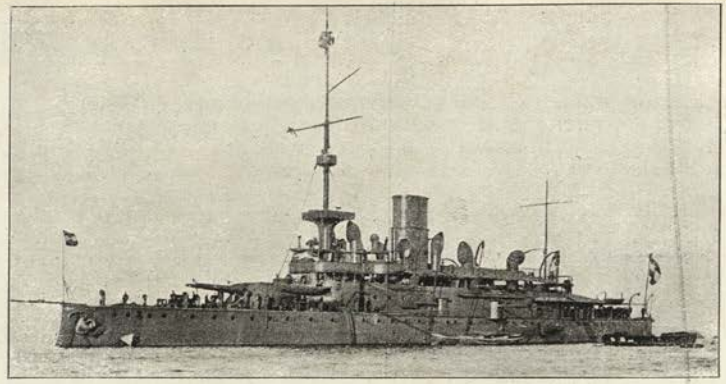


Broadside: 3—9·4 in., 6—6in.

Machinery: 2 sets triple expansion. 4 cylinder. 2 screws. Boilers: 16 Belleville (model, 1900). Designed H.P. 11,900=18 kts., 14000=19 kts. Coal: *normal* 500 tons, *maximum* 840 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials:*	*Boilers*	*Best recent speed*
Habsburg	Triest	Stabilimento	Feb.'99	1903	14,942 = 19·64 *mean.*	Belleville	
Arpad	Triest	Tecnico	Nov.'99	1903	15,900 = 19·65 ,,	Belleville	
Babenberg	Pola	for all	May,'00	1904	16,230 = 19·67 ,,	Belleville	

Reconstructed 1913-14. All cowls, etc., removed.



BUDAPEST. *Photo, Laroux.*

WIEN (July, 1895), & **MONARCH** (May, 1895); **BUDAPEST** (April, 1896).

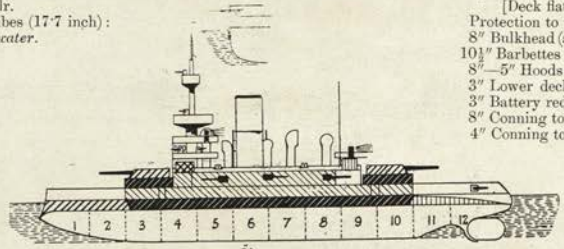
Displacement, 5600 tons. Complement, 400.

Length (*waterline*), 315 feet. Beam, 56 feet. *Maximum* draught, 21 feet. Length *over all*, 323 feet.

Guns (M. '86):
4—9·4 inch, 40 cal.
6—6 inch, 40 cal.
2—12 pdr. 18 cal.
14—3 pdr.

Torpedo tubes (17·7 inch):
2 *above water*.

Armour (Harvey):
10½″ Belt (amidships) *aa*
4⅔″ Belt (bow) ..... *d*
2½″ Armour deck (aft). [Deck flat on belt.]
Protection to vitals ...*aa*
8″ Bulkhead (aft). ..... *b*
10½″ Barbettes .....*aa*
8″—5″ Hoods to these *a-d*
3″ Lower deck redoubt *c*
3″ Battery redoubt..... *c*
8″ Conning tower ..... *b*
4″ Conning tower (aft). *d*



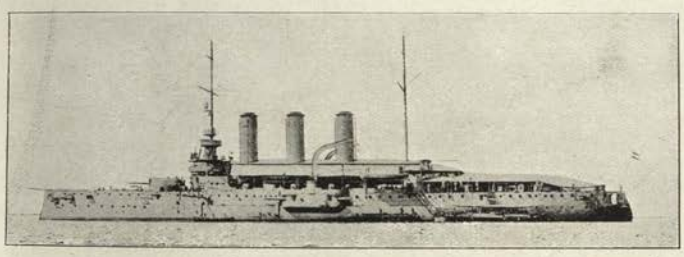
Ahead:
2—9·4 in.
2—6 in.

Astern:
2—9·4 in.
2—6 in.

Broadside: 3—9·4 in., 3—6 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: *Budapest*, Belleville (without economisers); other two, cylindrical. Designed H.P. 8500=17 kts. Coal: *normal* 300 tons; *maximum* 500 tons.

AUSTRO-HUNGARIAN ARMOURED CRUISERS.



(To distinguish from *K. K. VI* note foremast and funnels.)

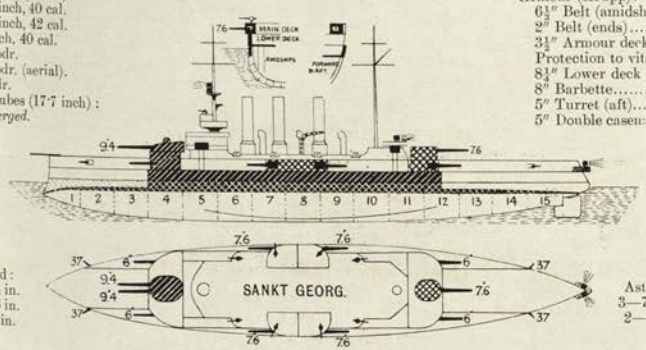
SANKT GEORG (December, 1903).

Displacement, 7400 tons. Complement, 600.

Length (*waterline*), 384 feet. Beam, 62 feet. *Mean* draught, 21½ feet.

Guns (Skoda) (M. '01):
2—9·4 inch, 40 cal.
5—7·6 inch, 42 cal.
4—6 inch, 40 cal.
9—12 pdr.
2—12 pdr. (aerial).
10—3 pdr.
Torpedo tubes (17·7 inch):
2 *submerged*.

Armour (Krupp):
6½″ Belt (amidships) ... *a*
2″ Belt (ends) ..... .
3½″ Armour deck ..... .
Protection to vitals ... = *a*
8½″ Lower deck side ... *aa*
8″ Barbette ..... *aa*
5″ Turret (aft) ..... *b*
5″ Double casemates (4) *b*



Ahead:
2—9·4 in.
2—7·6 in.
2—6 in.

Astern:
3—7·5 in.
2—6 in.

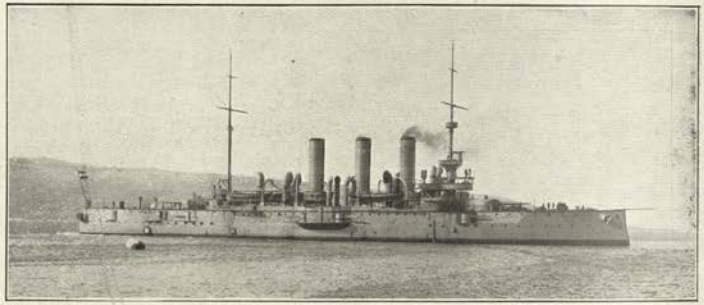
Broadside: 2—9·4 in., 3—7·5 in., 2—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: Yarrow. Designed H.P. *natural draught*, 12,300=21 knots; *forced*, 15,000=22. Coal: *normal* 600 tons; *maximum* 1000 tons.

Gunnery Notes.—Loading positions, big guns all round. Hoists: electric and hand. Big guns manœuvred electrically; 7·5 in. guns, electric; 6 in. guns, hand. Arcs of fire: Big guns 240°.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*		*Boilers*	*Best recent speed*
S. Georg	Pola	Stab. Tecnico	1903	1906	13,095=21·3	15,270=22	Yarrow	22·3

General Notes.—Cost £581,583.



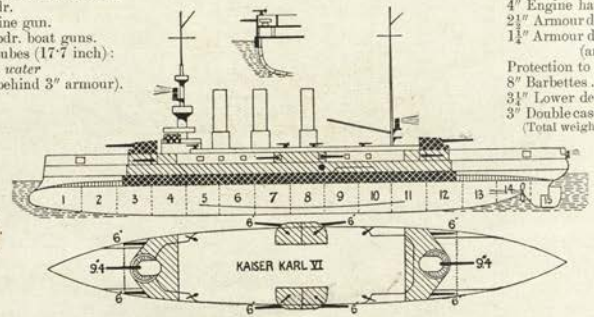
KAISER KARL VI (October, 1898). *Photo by favour of Oscar Parkes, Esq.*

Displacement, 6325 tons. Complement, 450.

Length (*waterline*), 367½ feet. Beam, 56 feet. *Mean* draught, 22⅛ feet.

Guns:
2—9·4 inch, 40 cal. (*A*).
8—6 inch, 40 cal.
2—12 pdr. 18 cal. (aerial).
16—3 pdr.
1 Machine gun.
2—12 pdr. boat guns.
Torpedo tubes (17·7 inch):
2 *above water* (behind 3″ armour).

Armour (Harvey-nickel)
8½″ Belt (amidships)... *a*
8″ Fore bulkhead ..... *a*
7″ After bulkhead ..... *b*
4″ Engine hatches.....
2½″ Armour deck (ends) *c*
1¾″ Armour deck (amidships).
Protection to vitals ... = *a*
8″ Barbettes ..... *a*
3½″ Lower deck redoubt *c*
3″ Double casemates (4) *c*
(Total weight 1400 tons).



Ahead:
1—9·4 in.
4—6 in.

Astern:
1—9·4 in.
4—6 in.

Broadside: 2—9·4 in., 4—6 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 18 Belleville. Designed 'H.P. 12,000=20 kts. Coal: *normal* 500 tons; *maximum* 820 tons.

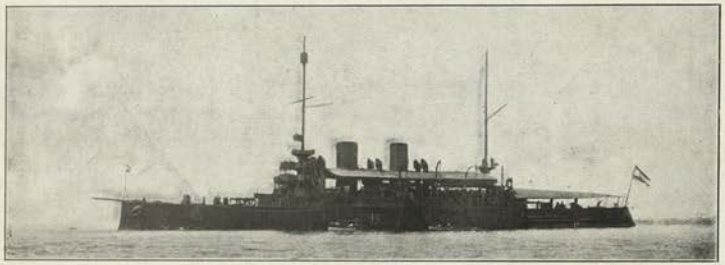
Armour Notes.—Belt is 6½ feet wide by 241 feet long. 3¾ feet of it below waterline. Lower edge is 6¾°.

Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric for all guns. Big guns manœuvred electrically. Secondary guns, hand. Arcs of fire: Big guns, 260°.

Torpedo Notes.—4 searchlights (automatic). Complete electric installation for all purposes.

Engineering Notes.—Machinery, etc. weighs 1100 tons. 129 revolutions=full speed. Pressure is 260 lbs. in boilers, reduced to 180 lbs. at engines.

Name.	*Builder*	*Machinery*	*Laid down*	*Completed*	*First Trials*	*Boilers*	*Best recent speed*
K. Karl VI	Stab. Tecnico	Stab. Tecnico	1896	1899	12,900=20·83	Belleville	20·2



Photo, Spartali.

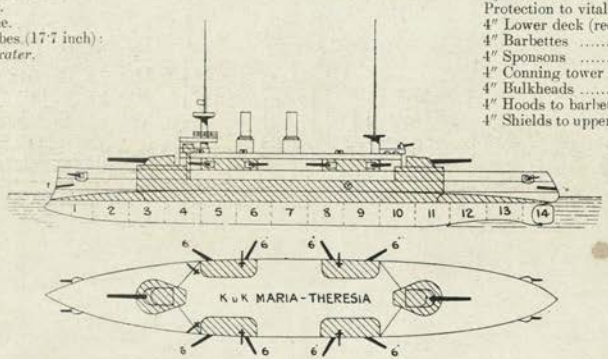
KAISERIN-UND-KÖNIGIN-MARIA-THERESIA (April, 1893).

Displacement, 5200 tons. Complement, 450.

Length (*waterline*), 351 feet. Beam, 52½ feet. *Mean* draught, 21½ feet. Length *over all*, 374 feet.

Guns:
2—7·6 inch, 42 cal.
8—6 inch, 35 cal.
16—3 pdr.
1 Machine.
Torpedo tubes (17·7 inch):
4 *above water.*

Armour (steel):
4″ Belt (amidships) ..... €
2½″ Armour deck .....
Protection to vitals ..... €
4″ Lower deck (redoubt) €
4″ Barbettes ..... €
4″ Sponsons ..... €
4″ Conning tower ..... €
4″ Bulkheads ..... €
4″ Hoods to barbettes ... €
4″ Shields to upper deck guns



Ahead:
1—7·6 in.
4—6 in.

Astern:
1—7·6 in.
4—6 in.

Broadside: 2—7·6 in., 4—6 in.

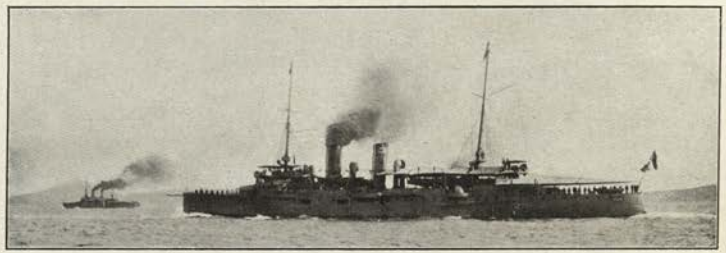
Machinery: 2 sets horizontal triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. *natural* 5880=17 kts.; *forced* 9000=19 kts. Coal: *normal* 600 tons; *maximum* 740 tons.

Armour Notes.—Belt is 7½ feet wide by 207 feet long; 5¾ feet of it below waterline.

Gunnery Notes.—Loading positions, big guns: end on. Big guns manœuvred electrically.

Engineering Notes.—On first trials (1895) she made 17·1 with *maximum* draught, and 19·3 with *forced* draught. Present *maximum* speed over 17½ kts.

General Notes.—Built at San Rocco. Reconstructed 1907. Originally carried two 9·4 inch.



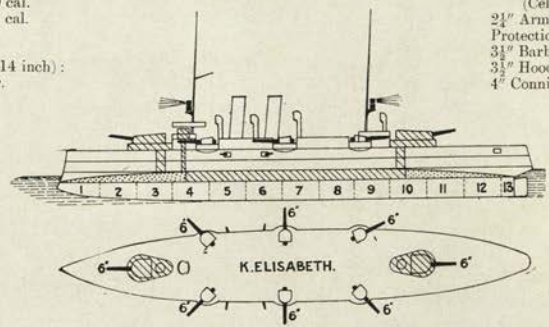
KAISERIN-ELISABETH (September, 1890), **KAISER-FRANZ-JOSEF** (May, 1889).

Displacement, 4060 tons. Complement, 450.

Length (*waterline*) 321 feet. Beam, 49 feet. *Mean* draught, 19 feet.

Guns (re-armed 1905-06):
2—6 inch, 40 cal.
6—6 inch, 35 cal.
16—3 pdr.
1 Machine.
Torpedo tubes (14 inch):
4 *above water.*

Armour (steel):
(Cellulose belt).
2¼″ Armour deck ..... €
Protection to vitals ... €
3½″ Barbettes..... €
3½″ Hoods to these .. €
4″ Conning tower ..... €



Ahead:
3—6 in.

Astern:
3—6 in.

Broadside: 5—6 in.

Machinery: 2 sets horizontal triple expansion. 2 screws. Boilers: 4 cylindrical, double-ended. Designed H.P. *natural* 6400=18 kts; *forced* 8000=19 kts. Coal: *normal* 400 tons; *maximum* 600 tons.

Engineering Notes.—The ships burn enormous quantities of coal, but can still steam at a very fair speed. On first trials both exceeded or nearly reached 20 knots.

General Notes.—Originally carried 2—9·4 inch, 35 cal. and 6—6 inch. Reconstructed 1905-06.

(Improved Spaun Class.)

SAIDA (Oct., 1912), **HELGOLAND** (Nov., 1912), **NOVARA** (1913).

Normal displacement, 3500 tons.

Length (*waterline*), 420 feet. Beam, 42 feet. *Mean* draught, 15 feet. Length *over all*, 424 feet.

Guns:
9—4·1 inch
2—12 pdr. 18 cal.

Torpedo tubes (17·7 inch):
4 *above water*.

Armour (steel):
$2\frac{1}{2}$" Belt (amidships).....
$\frac{3}{4}$" Deck .....
Protection to vitals .....

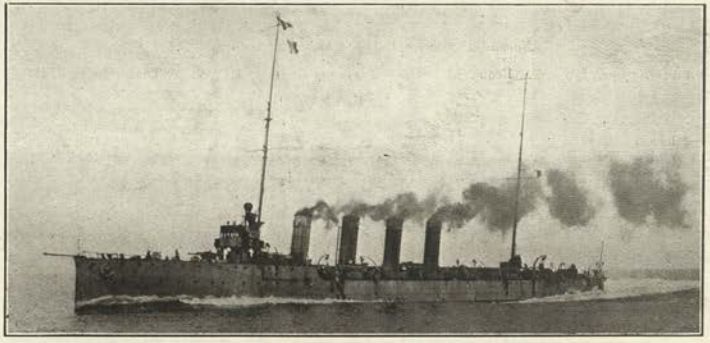
Ahead:
3—4·1

Astern:
2—4·1

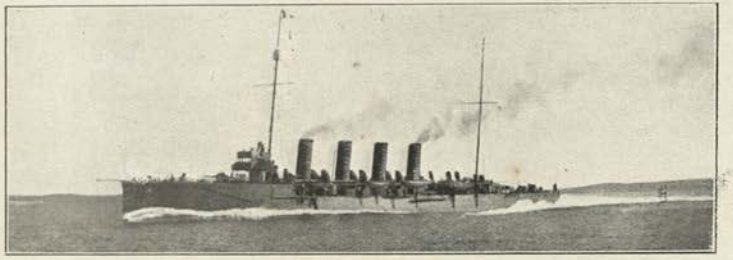
Broadside: 5—4·1 inch.

Machinery: Turbine (*see Notes*). 2 screws. Boilers: 16 Yarrow. Designed H.P. 25,000=27 kts. Coal: *normal*, 450 tons; *maximum*, 850 tons.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Trials.*	*Turbines.*	*Boilers.*	*Best recent speed.*
Saida	Monfalcone	Prager Masch.	Oct. '11	*to be* '14		Pfenninger	Yarrow	
Helgoland	Fiume	Danubius	Oct. '11	'14		A.E.G.	Yarrow	
Novara	Fiume	Danubius	Feb. '12	'14		A.E.G.	Yarrow	



June, 1914. Saida. *Official Photo.*



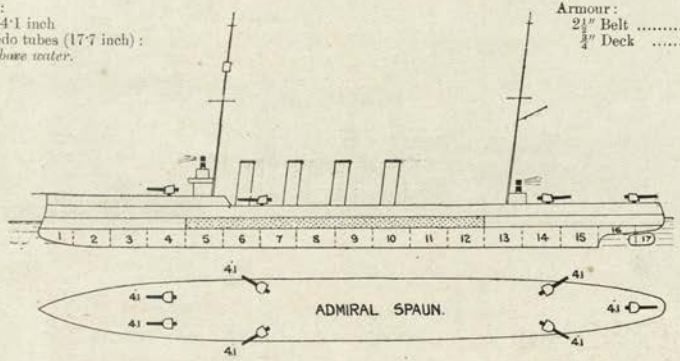
ADMIRAL SPAUN (October, 1909).

Normal displacement, 3500 tons. Complement, 320.

Length (*waterline*), 408 feet. Beam, 42 feet. *Maximum* draught, 15 feet. Length *over all*, 411 feet.

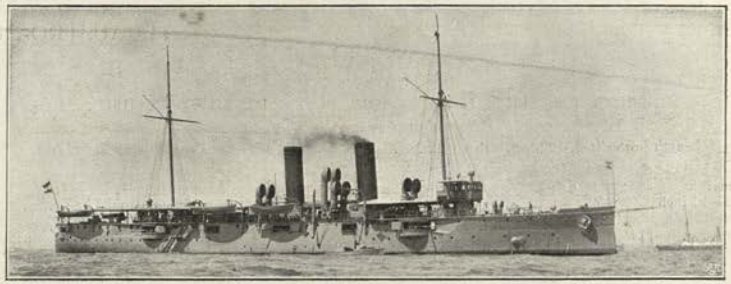
Guns:
7—4·1 inch
Torpedo tubes (17·7 inch):
2 *above water*.

Armour:
2½" Belt ..... *f*
¾" Deck .....



Machinery: Parsons turbine. 4 screws. Boilers: 16 Yarrow. Designed H.P. 20,000 = 26 kts. Coal: *normal* 450, *maximum* 850.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*First Trials*	*Boilers*	*Present best speed*
A. Spaun	Pola	Stab. Tecnico	Jan.'08	1910	25,000 = 27·02	Yarrow	27



All now carry a small crow's nest high on the foremast.

ZENTA (August, 1897), **ASPERN** (May, 1899), **SZIGETVAR** (October, 1900).

Displacement: *Zenta* 2300, *Aspern* 2400, *Szigetvar* 2350 tons. Complement, 300.

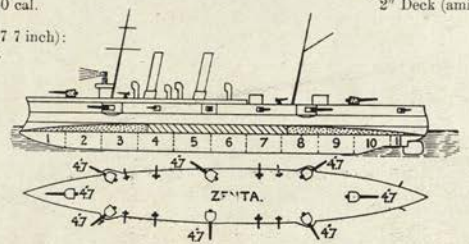
Length (*waterline*), 313½ feet. Beam, 39½ feet. *Maximum* draught, 17 feet (varies a little).
(*Zenta* is 10 feet shorter).

Guns:
8—4·7 inch, 40 cal.
10—3 pdr.
Torpedo tubes (17·7 inch):
2 *above water*.

Armour (steel):
2" Deck (amidships)... = *e*

Ahead:
3—4·7 in.

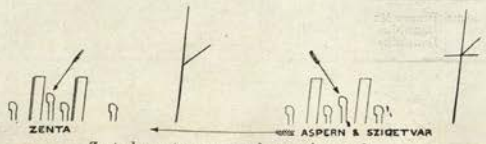
Astern:
3—4·7 in.



Broadside: 5—4·7 in.

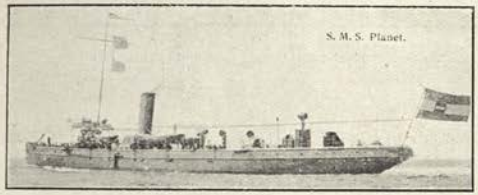
Machinery: 2 sets triple expansion. 2 screws. Boilers: 8 Yarrow. Designed H.P. 7200 = 20 kts. Coal: *normal* 300 tons; *maximum* 500 tons.
Engineering Notes.—Heating surface 20,000 square feet. Grate area 3500 square feet.
General Notes.—Average cost per ship £150,000.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials*	*Boilers*	*Best recent speed*
Zenta	Pola	Stab. Tecnico	'96	'98			Yarrow	19·5
Aspern	Pola	Stab. Tecnico	Jun.'98	'00			Yarrow	
Szigetvar	Pola	Stab. Tecnico	Jun.'99	'01			Yarrow	20·1

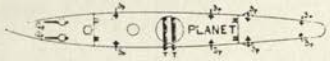


Zenta has a topmast on fore; others pole.

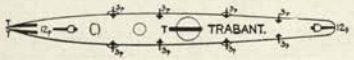
AUSTRO-HUNGARIAN TORPEDO GUNBOATS.



PLANET (1889, Jarrow). 480 tons. Complement, 78. Guns: 2—12pdr., 8—3 pdr. Torpedo tubes (T): 3 *above water*. Armour: $\frac{3}{4}$″ over engines. Machinery: 2 sets triple expansion. 2 screws. Boilers: locomotive. Designed H.P. 3500 = 20 kts.



TRABANT (1890). 540 tons. Complement, 78. Guns: 2—12 pdr. 8—3 pdr. Torpedo tubes (T): 3 *above water*. Armour: $\frac{3}{4}$″ over engines. Machinery: 2 sets triple expansion. 2 screws. Boilers: 4 locomotive. Designed H.P. 3500 = 20 kts. Coal: 150 tons.



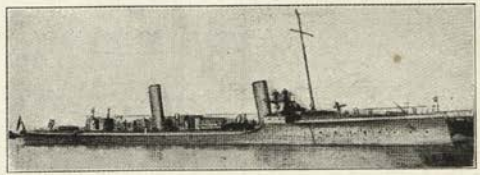
Has three funnels now. See Silhouettes.

SATELLIT (Schichau 1893). 540 tons. Complement, 61.

Guns:
1—12 pdr.
8—3 pdr.
Torpedo tubes:
3 *above water*.

Armour:
$\frac{3}{4}$″ over engines.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 2 Yarrow. Designed H.P. 4600 = 22·6 kts. (*trial* in bad weather 4600 = 21·87 kts.).



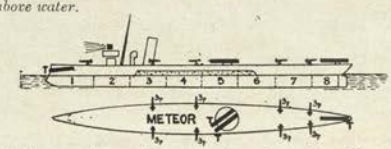
MAGNET.

No photo available. See Silhouettes.

METEOR (Schichau, 1887). 350 tons. Complement, 49.

Guns:
8—3 pdr.
Torpedo tubes:
4 *above water*.

Armour:
$\frac{3}{4}$″ over engines.

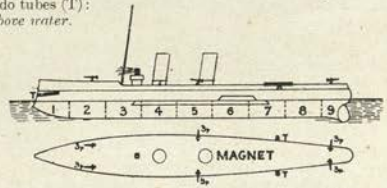


Machinery: 1 set triple expansion. 1 screw. Boilers: locomotive. Designed H.P. 2600 = 21 kts. Coal: 120 tons (bunker capacity).

MAGNET (Schichau, 1896). 510 tons.

Guns:
6—3 pdr.
Torpedo tubes (T):
3 *above water*.

Armour:
$\frac{3}{4}$″ over engines.

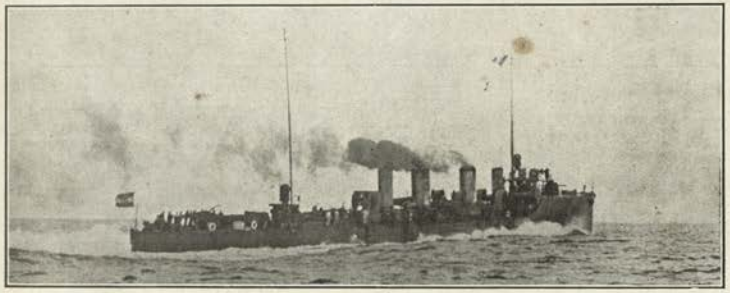


Machinery: 2 sets triple expansion. 2 screws. Boilers: Thornycroft. Designed H.P. 5000 = 26 kts. (exceeded on *trial*). Coal: 105 tons.

18 Destroyers.

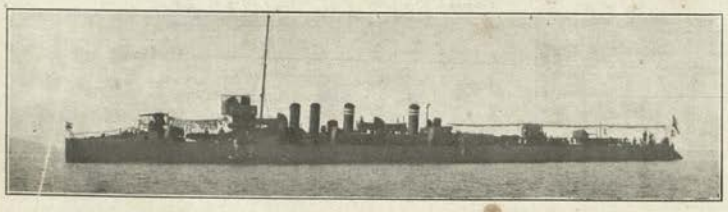
No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			
6	*Tatra*	'11-'13	800	17,000	32 (*t*)	...	...	2	...
6	*Huszar* (Y)	'07-'10	390	6000	28	90 coal	64	2	8
2		'07-'09							
3		'06-'08							
1		'05-'07							

(Y) = Yarrow type.



Tatra, Balaton, Csepel, Lika, Orjen, Triglav (——1912-13). Armament: 2—4 inch, 6—12 pdr., 4—17·7 inch tubes. A.E.G. turbine. 5 Yarrow boilers Dimensions: 265½ × 25½ × 8½ feet. Oil fuel, also coal.

Later Six Huszars. *Photo, Spartiali*



Early Six Huszars. *Photo, Spartiali.*

Huszar class named: ***Huszar*** (1905), ***Ulan, Streiter, Wildfang*** (1906), ***Uskoke, Scharfschütze*** (—'08), also ***Csikos, Dinara, Pandur, Reka, Turul, Velebit*** (—'08-'09). *Yarrow* type. 390 tons. Armament: 6—12 pdr., 2—17·7" tubes. Designed H.P. 6000 = 28 kts. 4 Yarrow boilers Complement 64. Coal: 90 tons. *Huszar* built by Yarrow; rest Stab. Tecnico.

51 Sea-going, 40 Coastal (= total of 91) Torpedo Boats.

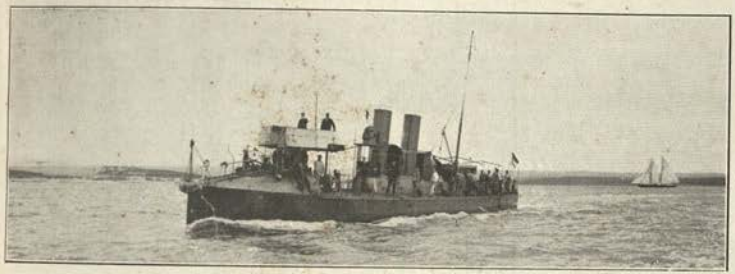
Type.	Date	Displacement.	I.H.P.	*Max.* speed	Coal and Oil.	Complement.	Tubes.
Sea-going —							
27 new (74 T—81 T; 82 F—97 F; 98 M—100 M)	1911-13	250	5000	28(*t*)	...	...	2
24 *Kaiman (Yarrow)*	1905-'08	200	3000	26	47	29	2
Coastal—							
12 *No. 1—12* (oil fuel)	1909-10	110	2600	27	22	20	2
1 *No. 18 (Yarrow)*	1896	107	1800	26	30	20	2
4 *No. 13—17 (Yarrow)*	'98-'99	115	1800	26	30	20	3
1 *No. 45 (Schichau)*	1896	134	1800	26	30	20	3
23 *No. 19—40 (Schichau)*	'92-'86	78	900	19	28	16	2

Appearance as below but larger forebridge.

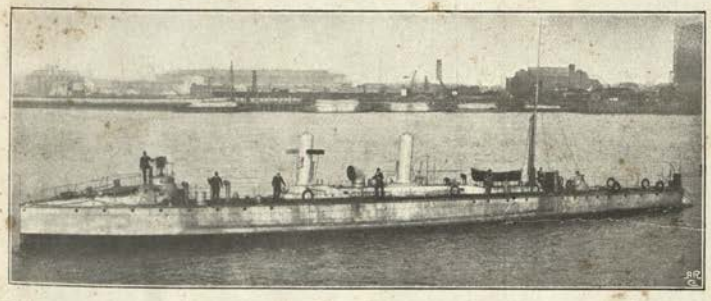
27 boats, ***100—74.*** Oil fuel and coal (¼ and ¾). Armament: 2—12 pdr., 2—17·7 inch torpedo tubes. Dimensions: 188 × 18½ × 5 *mean.*

Ex Kaiman class, ***50 E, 51 T—63 T, 64 F—73 F.*** Guns: 4—3 pdr. 2 tubes

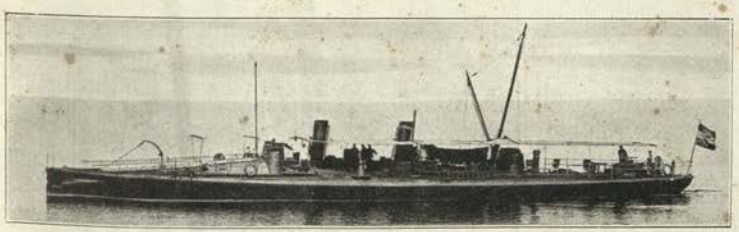
Coastal Torpedo Boats.



12 boats. Nos. ***1–12.*** Armament: 2–3 pdr., 2–17·7 inch tubes. Oil fuel only.



6 *Yarrow*. Nos. ***13–18.*** Guns: 2–3 pdr., 3–17·7 inch tubes.



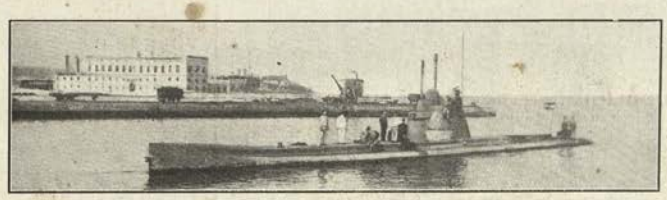
23 Schichau boats. ***14–40*** and ***45.*** Armament: 2–1 pdr., 2–14 inch tubes. (All reconstructed or reconstructing as here). Yarrow boilers

(Mostly used as mine sweepers).

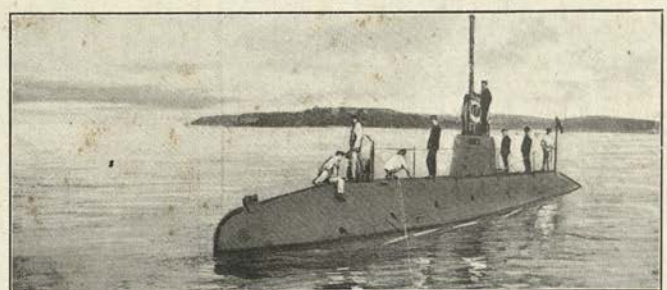
11 Submarines.

No. in Class	Type	First begun	Last Completed	Displacement. Surface	Surface H.P.	*Max.* speed above and below	*Max.* Surface Radius	Tubes	Complement
				tons		kts.	kts.		
5	U 7 – U 11 (G)	'12	'14	$\frac{\ldots}{520}$	...	...	...	...	...
2	U 6, U 5 (H)	'08	'10	236/273	500	$11\frac{1}{2}$—10	1000 (at 11)	2	16
2	U 4, U 3 (G)	'08	'10	237/300	600	11—8	1200 (at 9)	2	17
2	U 2, U 1 (L)	'08	'10	220/250	720	12—$7\frac{1}{2}$	...	3	...

(H) = Holland type. (G) = Germania, Krupp type. (L) = Lake type.

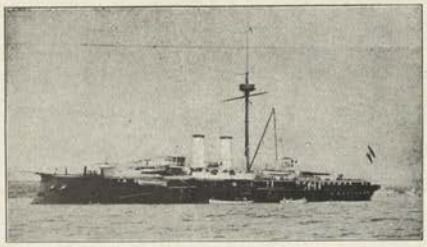


U 3 & 4. *Germania*. 141 × 12½ feet. $\frac{600}{720}$ H.P.

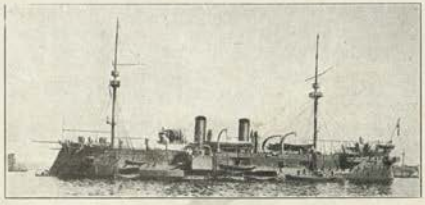


U 5 & 6. 100 × 13½. $\frac{600}{240}$ H.P. = $\frac{11{\cdot}2}{8{\cdot}3}$ kts. Dive in 3½ minutes.

Subsidiary Local Defence.

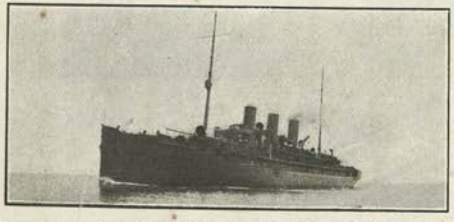


K. E. RUDOLF (1887). 6940 tons. Guns: 3 old 12 inch, 6 –4·7 inch. Belt, 12 inch steel amidships. Original speed, 16 kts.



MARS (*ex Tegetthoff*) (1878). 7390 tons. Guns: 6—old 9·4 inch Krupp, 5—old 6 inch. Belt, 14½″ iron. Original speed (re-engined 1892), 16 kts.

Torpedo Depot Ship.



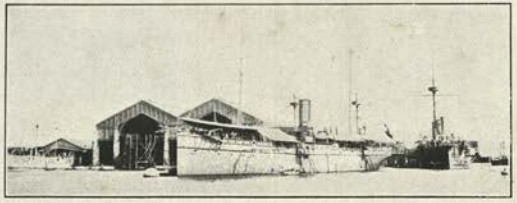
GAEA (1891), *ex Moskva* (Russian), *ex Furst Bismark* (German liner). 12,000. tons Armament, 4—4·7 inch, 4—12 pdr. Speed, 18 kts.

Repair Ship.

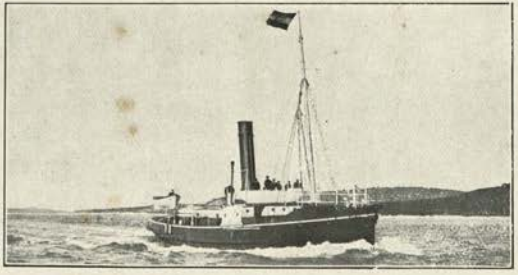
No photo.

VULKAN (1910). 950 tons. Guns: *nil*. Diesel motors. 1200 h.p. Speed, 15 kts.

Submarine Depot Ships.



PELIKAN (1891). 2440 tons. Speed, 14 kts.

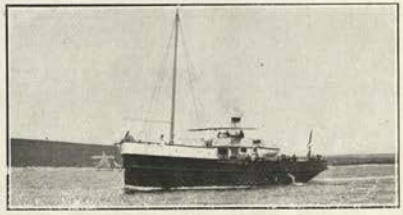


GIGANT (1889). 260 tons. H.P. 400—11 kts.

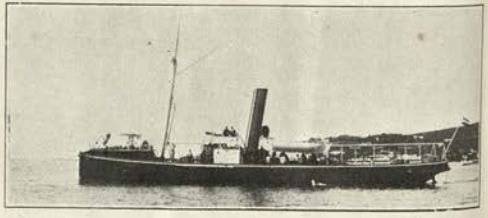
Mining Ships.

No photo.

BASILISK (1902). 310 tons. Armament: 2—3 pdr. Speed, 11 kts.



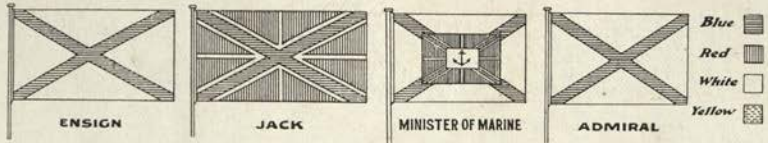
SALAMANDER (1891). 268 tons. Armament: 2—3 pdr. Speed, 10 kts.

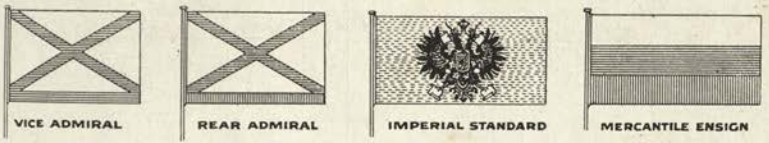


DROMEDAR (1891). 175 tons. Speed, 10 kts.

RUSSIAN FLEET.

Officially revised by order of the Minister of Marine. 1913, *not* in 1914. (Certain 1914 corrections have been omitted).





The *Ensign* is white, with a blue St. Andrew's cross; the *Jack* red, with a blue St. Andrew's cross.
Admiral's Flag: ensign made square; Vice-Admiral ditto, with a blue line at bottom; Rear-Admiral the same, with a red line. Port Admirals have a central rectangle in flag, with blue crossed anchors.
Mercantile Ensign: white, blue and red, in lines.
Imperial Standard: yellow, with black two-headed eagle, &c., in centre.

SEVASTOPOL to	miles.
Batûm	400
Biserta	1300
Constantinople	298
Gibraltar	2000
Kertch	175
Malta	1000
Nikolaieff	200
Novorossisk	200
Odessa	165
Piræus	660
Salonika	643
Toulon	1654

LIBAU to	miles.
Brest	1430
Cherbourg	1220
Copenhagen	465
Danzig	360
Gibraltar	2330
Kiel	550
Memel	230
Revel	50
Rosyth	1010
Vladivostock	12,405
Windau	50

KRONSTADT to	miles.
Abo	250
Bornholm	627
Brest	1680
Cherbourg	1470
Copenhagen	715
Danzig	558
Gibraltar	2580
Helsingfors	150
Kiel	800
Libau	250
Memel	480
Revel	150
Rosyth	1345
St. Petersburg (By sea canal)	21
Vladivostock	12,655
Windau	200

VLADIVOSTOCK to	miles.
Hong Kong	1740
Kiao-chau	1150
Maitsuru	470
Manila	2080
Matsumai	380
Nagasaki	620
Port Arthur	1170
Sassebo	600
Wei-hai-wei	950

RUSSIAN DOCKYARDS, Etc.

Divided into squares of 2000 yards. Uniform scale. Soundings in fathoms. Heights in feet.

Merchant Fleet.

This, including vessels on the Caspian, consists of 1015 steamers of 488,472 tons net; 2516 sailing vessels, 254,330 tons net.

Chief Trade Ports.

St. Petersburg, Riga, Odessa, Vladivostok, Helsingfors.

COINAGE: 1 rouble (100 kopecks) = 2*s.* 1¼*d.* British, half-a-dollar American (*approx.*).

Colour of Ships.

Dark grey all over; destroyers greenish-grey.

Personnel.

About 60,000 all ranks.

Oversea Possessions: None.

Minister of Marine: Admiral Grigorovitch.

Naval Arsenals, Etc.

KRONSTADT. Fitting out and repairing yard for Baltic Fleet. No slips. Four large dry docks: (*a*) Alexander, 600×85×29½ feet; (*b*) Constantine, 490×85×29 feet; (*c*) Nikolai; (*d*) Peter, smaller, but both able to take most Russian ships except the big cruisers.

Kronstadt is fed from the shipbuilding yards at St. Petersburg, the New Admiralty (2 slips), Galernii Ostrov (3 slips), Baltic works (3 slips), and torpedo-boat yards at Ijora (on the Neva). The channel above Kronstadt is only 26 feet deep.

Admiralty Chart No. 3215.

PORT ALEXANDER III. (Libau). Ice-free base down the Baltic coast. Two big basins; two docks (600×85×30) able to take any ships afloat.

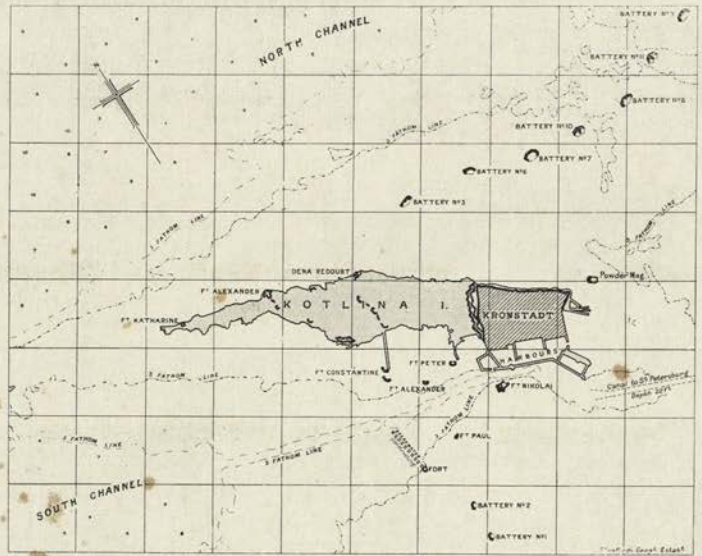
Admiralty Chart No. 1770.

PORT PETER THE GREAT (Revel).

Other fortified Baltic bases, without docks, etc., are: Dünamünde, Viborg, Sveaborg, Revel, Riga, Windau.

Commercial harbours at Libau, Revel (old State yard), Riga, Kronstadt, St. Petersburg, Helsingfors (with a dock 314×56×18½ feet).

Private yards at St. Petersburg: Pontilovsky, Nevsky Mettalichesky; at Abo (Finland), at Riga, at Revel, at Helsingfors.



KRONSTADT.

SEVASTOPOL.

LIBAU.

VLADIVOSTOK.

(In the Black Sea).

SEVASTOPOL. Two slips. Two large docks (487×85×32 and 445×85×28), able to take any ship in Black Sea Fleet. One basin.

Admiralty Chart No. 963.

NIKOLAIEFF. Building yard only. Strongly fortified approaches. Too shallow water for use as a base. A private yard exists here.

Other fortified Black Sea bases without yards or docks; Batûm, Kinburn, Ochakoff, Azov, Kertch, Yenikali, Poti (all well fortified).

Commercial harbours at Odessa, Batûm.

(In the Pacific).

VLADIVOSTOK. Small dockyard. Two docks (618½×90×34½ and 572×90×30), able to take any warship in the world. One small floating dock 300 feet long. Two small basins. Some repairing shops. Water shallow. Good *tideless* protected harbour. Strongly fortified (high-site batteries with 10 in. disappearing guns).

Admiralty Chart No. 1011.

Commercial harbours: Vladivostok, Nikolaievsk.

AG Volga.

AH Minref, etc. (*minelayers*).

BG Posadnik *class*.

BH Khrabry.

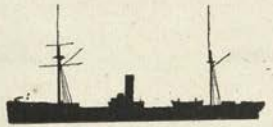
BJ Groziastchy.

CH Petscora.

DH Bakane and Silatch.

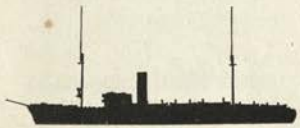
DI Lachta.

DJ Europa.



DK Africa.

EM Mandjur.



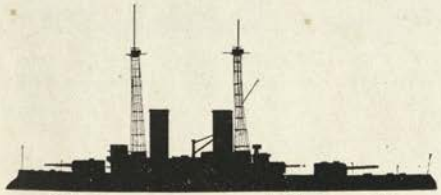
EK Narova (*minelayer*).

EN Voin (*Training Ship*).

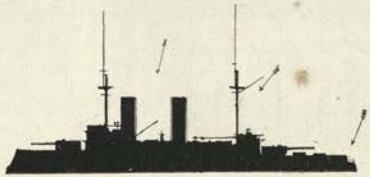
FU Nikolaieff.

GA Khivenetz.

GH Giliak *class* (4 ships).



HF Imperator Pavel *class* (2 ships) (*page* 340).

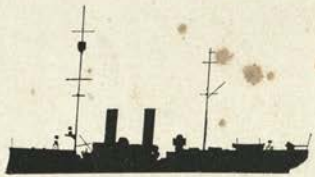


IG Slava (*page* 341).

IH Tsessarevitch (*page* 341).

Aleksandr II or Pedr Velikv (*page* 347).

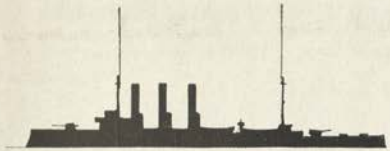
J Gangoot *class* (4 ships) (*page* 339).



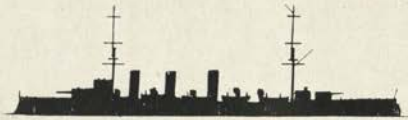
JI Amoor *class* (*Mine Layers*).

KN Standart (*Imperial Yacht*).

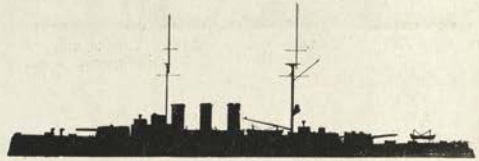
BALTIC, Etc.



MG Aurora (*page* 346).



MH Bogatyr *class* (*page* 346).

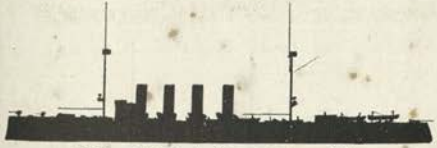


NC Rurik (*page* 342).

Dwina (*harbour service*).

OG Okean (*training ship*)

PR Jemtchug (*page* 346).



SG Rossiya & Gromoboi (*page* 344).

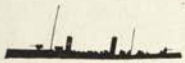
TG Bayan *class* (3 ships) (*page* 343).

VG Askold (*page* 346).

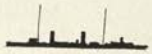
RT cone.

RUSSIAN TORPEDO CRAFT IDENTIFICATION AND SIGNAL SILHOUETTES.

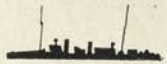
H Schichau t.b.



M Schichau destroyers (21).



N Normand t.b.

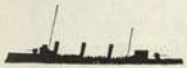


L Later Normand type t.b.

P Amuretz t.b.d.

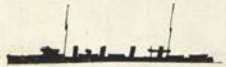
R E. Bucharski.

S Kondratenko class t.b.d. (4).

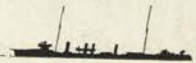


Q Strashni type t.b.d. (8).

V French type destroyers.



X Yarrow type destroyers.



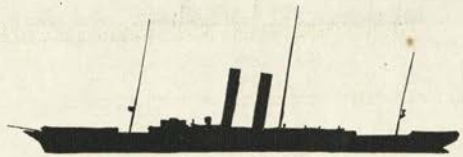
Y

Z Novik t.b.d.

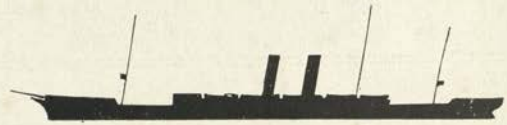
RM cone.

RUSSIAN SUBSIDISED OR GOVERNMENT LINERS OF 18 KNOTS OR OVER.

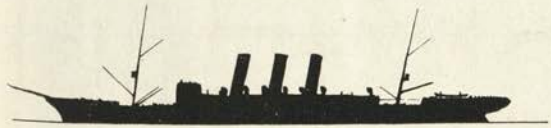
J Saratov (18 kts.)



K Petersburg (18 kts.)



L Kherson (18·5 kts.)



N Smolensk (20 kts.)

BLACK SEA FLEET ONLY.

CH Bug & Dusa.

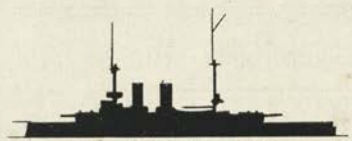
CN Teretz *class.*

CASPIAN.

Kars & Ardigan.

HK Almaz.

IJ Georgi Pobiedonosets *class* (*page* 357).



IK Rostislav (*page* 356).

IM Tri Sviatitelia (*page* 356).

LQ Berezan (*Training Ship*).

LX Kronstadt (*Repair Ship*).

MH Kagoul *class* (*page* 357).

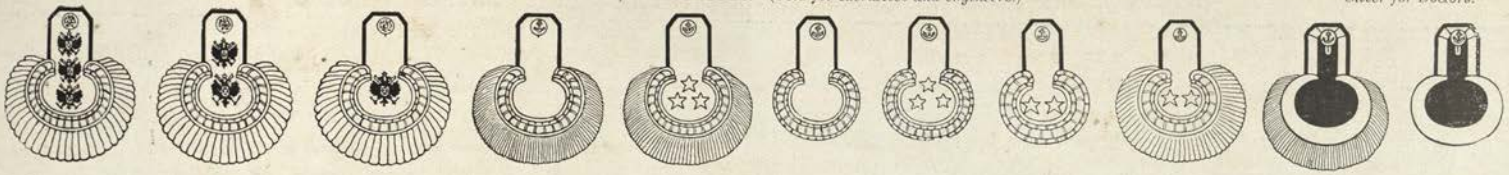
OH Ievstafi *class* (*page* 355).

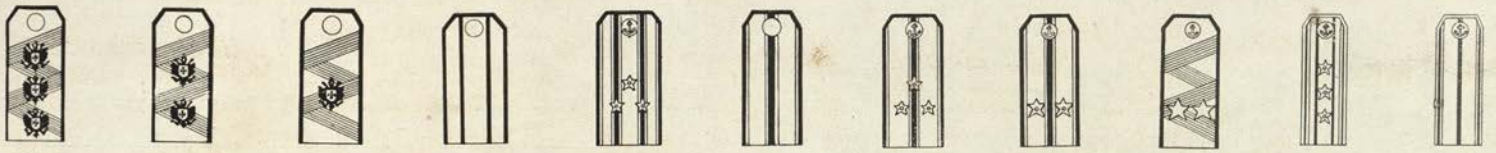
OI Pantelimon (*page* 355).

RUSSIAN UNIFORMS, GUNS, Etc.

FULL DRESS, EPAULETTES. *(Gold for executives and engineers.)*

Silver for Doctors.





Admiral. " | Vice-Admiral. " | Kontre-Admiral. *(Rear-Admiral.)* | Kapitan. I. Ranga. *(Captain).* | Kapitan. II. Ranga. *(Commander.)* | Starchy Leitenant *(Senior Lieut.)* | Leitenant. *(Lieutenant.)* | Mitchman. *(Sub-Lieutenant.)* | ENGINEERS. In higher ranks: General-Major with two stars. General-Lieut. with three stars. General—no stars. All lower ranks same as executives. | Senior | Junior | DOCTORS. Silver straps with black stripes.

Gold straps, with black bands and stars (if any) silver. Specialist officers wear a badge on the right breast with the usual insignia for gunnery, torpedo, submarines, and plungers. The uniforms are: Full dress parade with epaulettes and cocked hats; Undress, black frock coat or a blue reefer coat of the usual sort with shoulder straps; white undress coat with shoulder straps as before and white cap. Swords are worn instead of dirks in cases of parades.

Modern Naval Guns (Obuchoff).

Notation.	Designation.	Length in Calibres.	Weight of Guns.	Weight of A.P. Shot.	Initial Velocity (approximate).	*Maximum* Penetration with A.P. Capped Shell against K.C. Armour.			Danger Space against average warship, at			Usual Rounds per minute.
						8000 yds.	5000 yds.	3000 yds.	10,000 yards.	5000 yards.	3000 yards.	
	inch.	calibres.	tons.	lbs.	f. s.	in.	in.	in.	yards.	yards.	yards.	
A^7	14	45	...	...	...	..	...	...	...	...	...	...
A^6	12	50	...	...	...	..	...	...	...	...	...	...
A^4	12	40	59	724	2600	$6\frac{1}{2}$	14	18	150	460	750	0·30
AA	12	35	56	731	2200	$4\frac{1}{2}$	8	11	120	380	580	0·25
AAA	10(V)	45	35	497	3000	6	$12\frac{3}{4}$	$15\frac{1}{2}$	...	...	...	...
AAA	10	45	32	490	2500	5	$10\frac{1}{2}$	13	130	450	700	0·45
AA	9	45	26	403	2500	4	$8\frac{1}{2}$	11	...	...	...	0·80
B	9	35	$19\frac{1}{2}$	268	2400	...	$5\frac{1}{2}$	$7\frac{1}{4}$	...	...	...	0·50
A	8(V)	50	17	216	3300	...	$7\frac{1}{2}$	$10\frac{1}{2}$	...	...	...	...
A	8	45	$15\frac{1}{2}$	188	2800	...	6	$9\frac{1}{2}$	105	430	625	1
D^*	6	45	$7\frac{1}{2}$	89	2900	...	$4\frac{1}{4}$	6	60	250	485	3
E^*	6	45	7	89	2600	...	$3\frac{1}{4}$	5	50	200	430	3
F^*	5·5	45	$4\frac{1}{2}$	66	2460	...	...	3	...	...	...	3
F^*	4·7	45	$2\frac{1}{4}$	46	2600	...	...	...	...	...	...	about 4
F^*	3	60	14 cwt.	$13\frac{1}{2}$	2700	...	...	...	...	...	...	...
F^*	3	35	12 "	$13\frac{1}{2}$	2600	...	...	...	...	...	...	...

* = Brass cartridge cases. V = Vickers Maxim. *Maximum* rates of 10 inch and 8 inch are 3 and 6 rounds per minute. These guns are in the *Rurik*.

1912 RUSSIAN BATTLE-CRUISERS (Baltic Dreadnoughts). Nos. 8, 7, 6, 5

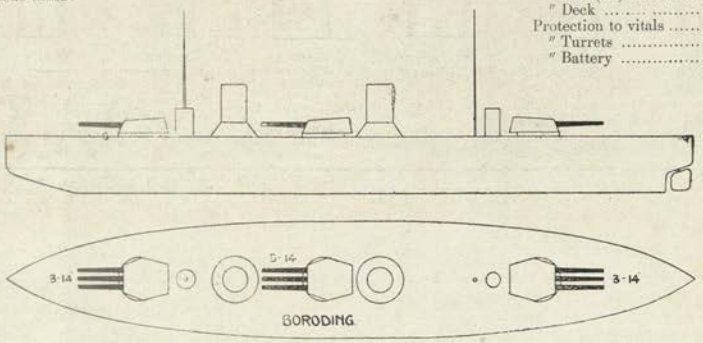
BORODINO (building), ISMAIL (building), KINBURN (building), NAVARIN (building).

Normal displacement, 28,000 tons. Complement, .

Length, feet. Beam, feet. Draught, feet.

Guns:
9—14 inch
20—5·1 inch
Torpedo tubes:

Armour:
9" Belt (amidships) ... *aa*
" Belt (bow) .....
" Belt (aft) .....
" Deck .....
Protection to vitals .....
" Turrets .....
" Battery .....



Machinery: Parsons turbine. screws. Boilers: Designed H.P. =26·5 kts.
Coal: *normal* tons; *maximum* tons. Oil: tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Turbines*	*Boilers*	*Best recent speed*
Borodino	Galernii		Dec. '12					
Ismail	Galernii		Dec. '12					
Kinburn	Baltic Works	Baltic Works	Dec. '12					
Navarin	Baltic Works	Baltic Works	Dec. '12					

Building

1909 RUSSIAN BATTLE-CRUISERS (23 knot). (Baltic Dreadnought). Nos. **4, 3, 2, 1**

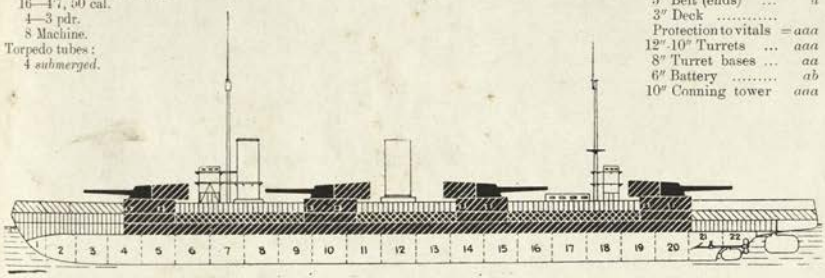
GANGOOT (Oct., 1911), *POLTAVA* (July, 1911), *PETROPAVLOVSK* (Aug., 1911), *SEVASTOPOL* (July, 1911).

Normal displacement, 23,300 tons. Complement,

Length *over all*, 590½ feet. Beam, 85½ feet. *Mean* draught, 27½ feet.

Guns:
12—12 inch, 50 cal. (*A*[6]).
16—4·7, 50 cal.
4—3 pdr.
8 Machine.
Torpedo tubes:
4 *submerged*.

Armour (Krupp):
9″ Belt (amidships) *aa*
5″ Belt (ends) ... *d*
3″ Deck .....
Protection to vitals = *aaa*
12″-10″ Turrets ... *aaa*
8″ Turret bases ... *aa*
6″ Battery ..... *ab*
10″ Conning tower *aaa*

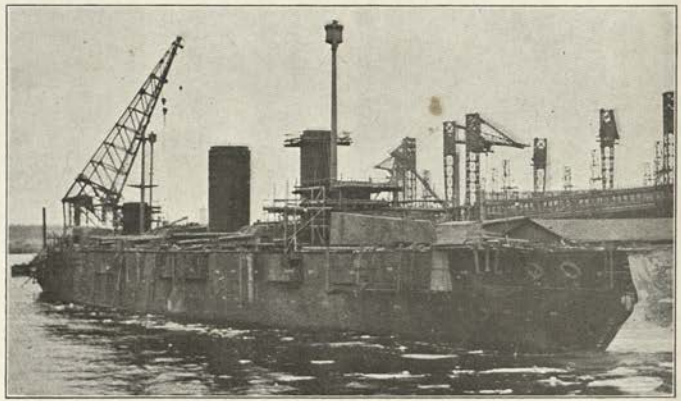


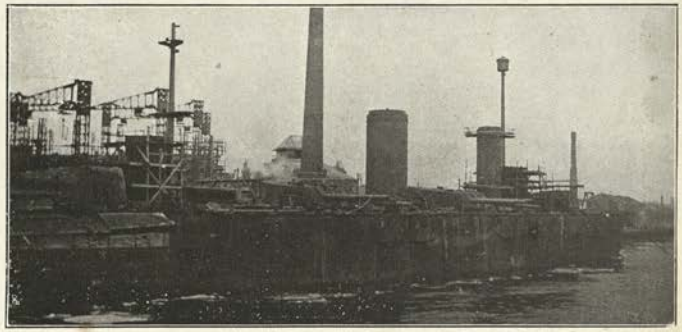
Machinery; Parsons turbine. 4 screws. Boilers: 25 Yarrow. Designed H.P. 42,000 = 23 kts. Coal: *normal*, 1000 tons; *maximum*, 3000 tons. Also 1170 tons oil.

Armour Notes.—Belt is about 15 feet wide, 5 feet of it below water. Uniform thickness.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Gangoot	Galerny I	Franco-Rus. Wks.	June,'09			Yarrow	
Poltava	Galerny I	Franco-Rus. Wks.	June,'09			Yarrow	
Petropavlovsk	Baltic Works	Baltic Works	June,'09			Yarrow	
Sevastopol	Baltic Works	Baltic Works	June,'09			Yarrow	

General Notes.—Designed, etc., by John Brown, Ltd., Clydebank.





(Imperator Pavel Class—2 Ships).

IMPERATOR PAVEL (Sept., 1907), & **ANDREI PERVOSWANNI** (Oct., 1906).

Normal displacement, 17,400 tons. Complement, 800.

Length (*waterline*), 454 feet. Beam, 80 feet. *Mean* draught, 27 feet. Length *over all*, 460 feet.

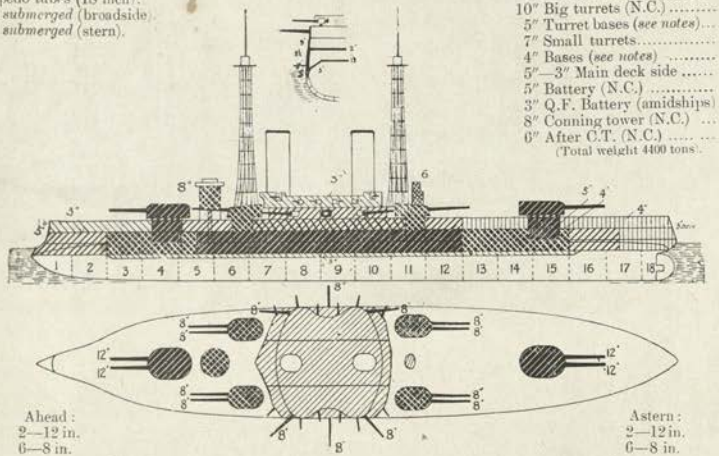
Guns:
4—12 inch, 40 cal. (*AAAA*).
14—8 inch, 50 cal. (*A*).
12—4·7 inch.
4—3 pdr.
8 Machine.

Torpedo-tubes (18 inch):
2 *submerged* (broadside).
1 *submerged* (stern).

Armour (Krupp):

8½" Belt (amidships)	*aa*
5" Belt (bow)	*c*
4" Belt (aft)	*d*
3" Deck	
2" Splinter deck	
Protection to vitals	= *aaa*
10" Big turrets (N.C.)	*aa*
5" Turret bases (*see notes*)	
7" Small turrets	*a*
4" Bases (*see notes*)	
5"—3" Main deck side	*b-e*
5" Battery (N.C.)	*c*
3" Q.F. Battery (amidships)	*e*
8" Conning tower (N.C.)	*a*
6" After C.T. (N.C.)	*b*

(Total weight 4400 tons).



Ahead:
2—12 in.
6—8 in.

Astern:
2—12 in.
6—8 in.

Broadside: 4—12 in., 7—8 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: Belleville. Designed H.P. 17,600 = 18 kts.
Coal: *normal* 1,500 tons; *maximum* 3,000 tons.

Armour Notes.—Belt is 7½ feet wide, 5 feet of it below waterline; lower edge is 3" thick. Turret bases 5"—4" according to the side armour forming additional protection to them. 3" floor to batteries.

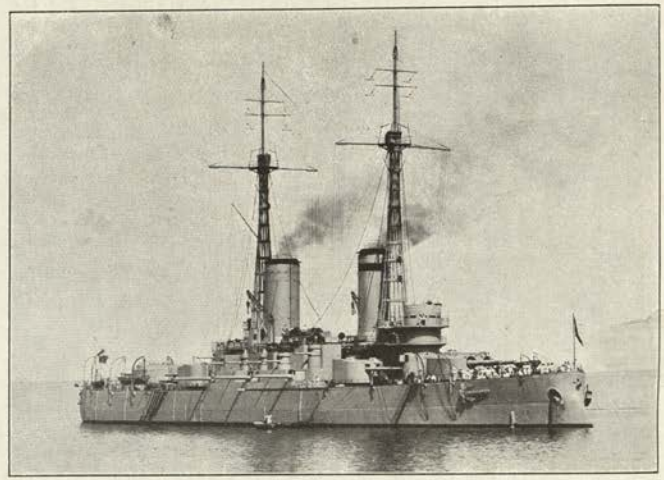
Gunnery Notes.—Loading positions, big guns: all round. Hoists: electric. Big guns manœuvred electrically; secondary turrets, electrically.
Arcs of fire: Big guns, 270°; secondary turrets (amidships) 180°, (others) 150°.

Torpedo Notes.—6 searchlights.

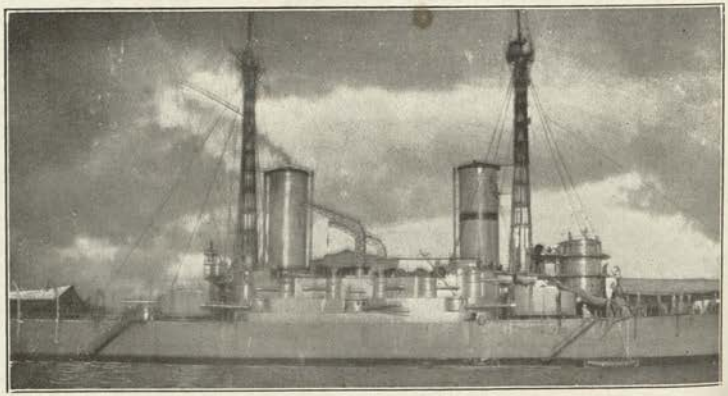
Engineering Notes.—

General Notes.—Design altered during construction in order to embody war lessons: armour thinned and extended to cover hull, Q.F. battery increased, etc., etc.

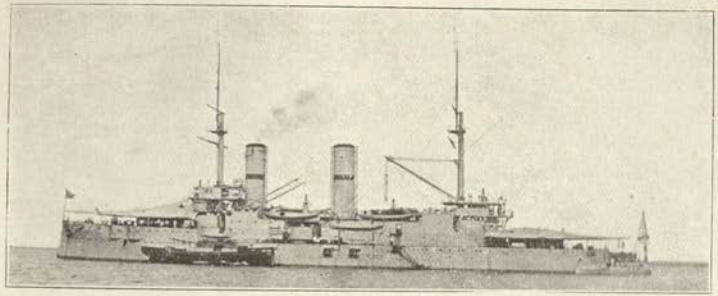
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*Trials*	*Boilers*	*Best recent speed*
A. Pervoswanni	Galernii Island	Baltic Works	Jan., '03	1911			Belleville	
Imperator Pavel	Baltic Works	Baltic Works	Sept., '03	1911			Belleville	



A. Pervoswanni. *Photo by favour of Oscar Parkes, Esq.*



Imperator Pavel. *Photo, Oscar Parkes, Esq.*



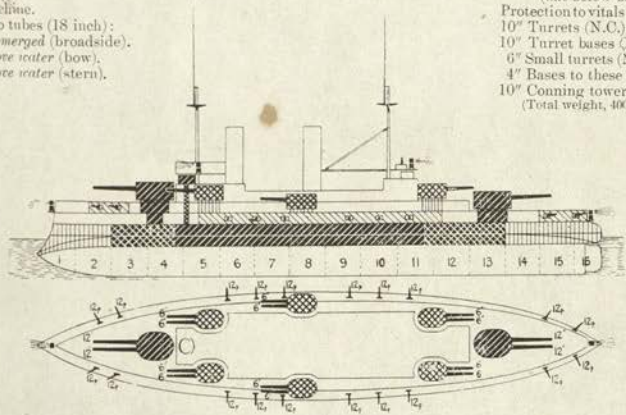
SLAVA (August, 1903).

Nominal displacement, 13,566 tons: actual *normal* about 15,000 tons. Complement, 750.
Length (*waterline*), 386½ feet. Beam, 76 feet. *Mean* draught, 26 feet. Length *over all*, 397 feet.

Guns:
4—12 in., 40 cal. (*AAAA*)
12—6 inch, 45 cal.
20—12 pdr.
4—3 pdr.
8 Machine.

Torpedo tubes (18 inch):
2 *submerged* (broadside).
1 *above water* (bow).
1 *above water* (stern).

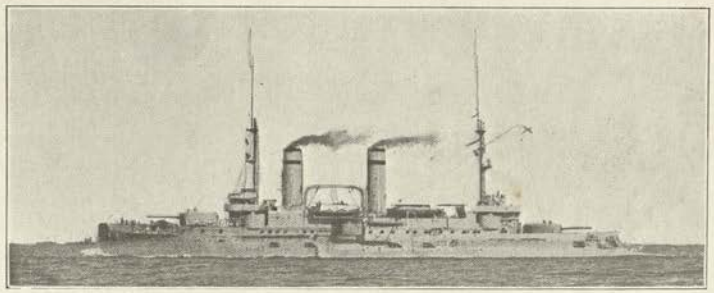
Armour (Krupp):
7¾″ Belt (amidships) ... *aa*
4″ Belt (ends) ..... *d*
4″ Armour deck (flat below belt)
Protection to vitals = *aaaaaa*
10″ Turrets (N.C.) ..... *aa*
10″ Turret bases (N.C.) *aa*
6″ Small turrets (N.C.) *b*
4″ Bases to these ..... *d*
10″ Conning tower ..... *aa*
(Total weight, 4000 tons.)



Broadside: 4—12 in., 6—6 in.

Machinery: 2 sets vertical 4 cylinder triple expansion. 2 screws. Boilers: 20 Belleville. Designed I.H.P. 16,000 = 18 kts. Coal: *normal* 750 tons; *maximum* 1250 tons.

Armour Notes.—Belt is 6¾ feet wide, 5 feet of it below waterline; lower edge is 7″ thick amidships; upper belt is 5¾ feet wide.



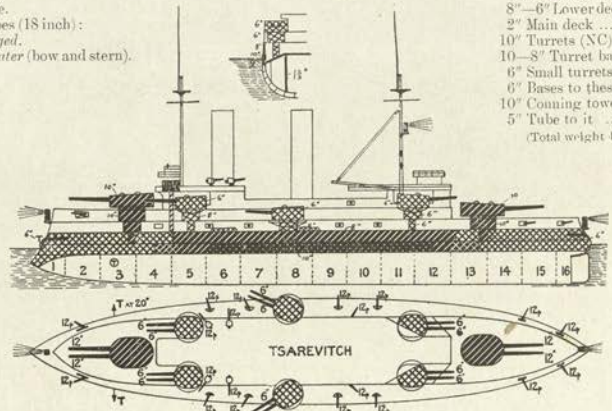
TSESSAREVITCH (February, 1901).

Normal displacement, 13,380 tons. Complement, 750.
Length (*waterline*), 388¾ feet. Beam, 75½ feet. *Maximum* draught, 28¼ feet. Length *over all*, 401 feet.

Guns:
4—12 inch, 40 cal. (*AAAA*).
12—6 inch, 45 cal.
20—12 pdr.
20—3 pdr.
6 Machine.

Torpedo tubes (18 inch):
2 *submerged*.
2 *above water* (bow and stern).

Armour (Krupp):
10″ Belt (amidships) .....*aaa*
6″ Belt (ends) ..... *b*
4″ Deck (slopes).....
Protection to vitals ...*aaaaa*
8″—6″ Lower deck side...*aa-b*
2″ Main deck .....
10″ Turrets (NC) .... *aa*
10—8″ Turret bases (NC) *aa*
6″ Small turrets (6)..... *b*
6″ Bases to these..... *c*
10″ Conning tower (NC)...*aa*
5″ Tube to it .....
(Total weight 4000 tons.)



Broadside: 4—12 in., 6—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 20 Belleville, without economisers. Designed H.P. 16,300 = 18 kts. Coal: *normal* 800 tons; *maximum* 1350 tons.

Armour Notes.—Main belt is 6½ feet wide; 5 feet of it below waterline; lower edge is 7″ thick amidships.

1905 RUSSIAN ARMOURED CRUISER (*Brononosny Kreisser*) (21 knot).

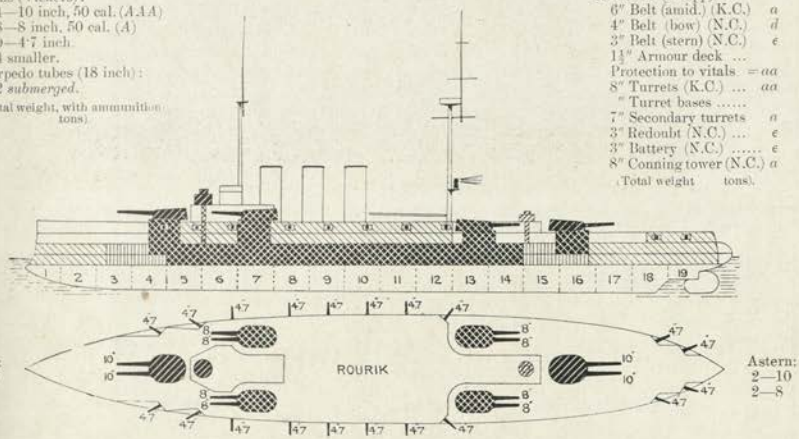
RURIK (17th Nov., 1906).

Normal displacement, 15,000 tons. Complement, 899.

Length (*waterline*), 529 feet. Beam, 75 feet. *Mean* draught, 26 feet. Length *over all*, — feet.

Guns (Vickers):
4—10 inch, 50 cal. (*AAA*)
8—8 inch, 50 cal. (*A*)
20—4·7 inch.
14 smaller.
Torpedo tubes (18 inch):
2 *submerged*.
(Total weight, with ammunition tons).

Armour: (Krupp)
6" Belt (amid.) (K.C.) *a*
4" Belt (bow) (N.C.) *d*
3" Belt (stern) (N.C.) *e*
1½" Armour deck ...
Protection to vitals = *aa*
8" Turrets (K.C.) ... *aa*
" Turret bases .....
7" Secondary turrets *a*
3" Redoubt (N.C.) ... *e*
3" Battery (N.C.) ..... *e*
8" Conning tower (N.C.) *a*
(Total weight tons).



Broadside: 4—10 in., 4—8 in.

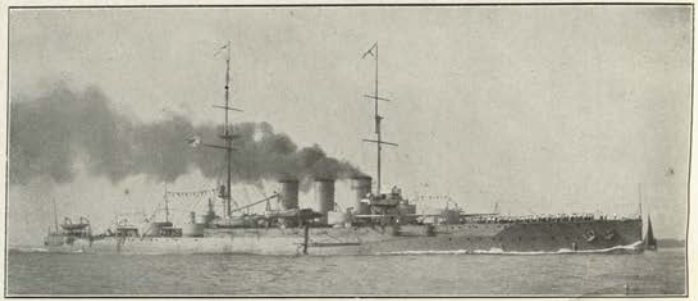
Machinery: 2 sets 4 cylinder quadruple expansion. 2 screws. Boilers: 28 Belleville. Designed H.P., with ¾ power, 19,700 = 21 kts., full power not specified. Coal: *normal* 1200 tons; *maximum* 2000 tons = *nominal* 8000 at 10 kts.

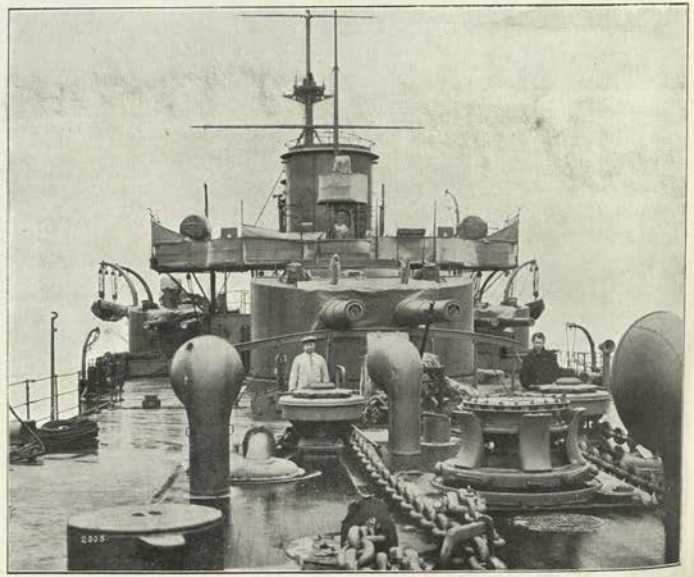
Gunnery Notes.—Big guns have 35° *maximum* elevation. Two armoured fire control stations.

Armour Notes.—Enormous increase of weight of defensive material has been introduced into this ship in view of the lessons learned from the Russo-Japanese War. Main belt is 12 feet high, the thick portion amidships being about 250 feet long. Armoured magazines. Special defence against torpedoes.

Engineering Notes.—There was no full speed contract for this ship. Instead she had to preserve a steady 21 kts. as "easy steaming"

Name.	*Builder.*	*Machinery*	*Laid down.*	*Completed.*	*Last refit*	*Trials: 10 hours mean*	*Boilers*	*Best recent speed*
Rurik	Vickers	Vickers	Sep. '05	Sep. '08		20,675 = 21·5	Belleville	22·4





Forecastle—looking aft.

1905 RUSSIAN ARMOURED CRUISERS (22 knot). (Officially rated as "Cruisers.")

(Bayan Class—3 Ships).

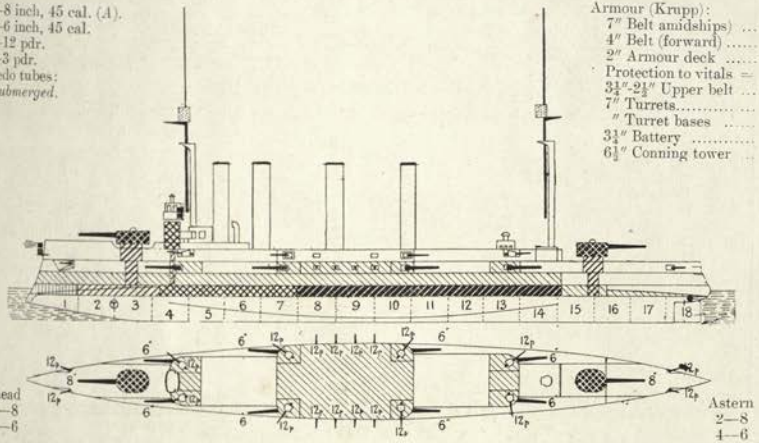
ADMIRAL MAKAROFF (May, 1906), **PALLADA** (Nov., 1906), **BAYAN** (Aug., 1907).

Displacement, 7775 tons. Complement, 568.

Length (*waterline*), 443 feet. Beam, 57 feet. *Mean* draught, 21¼ feet. Length *over all*, 449⅝ feet.

Guns:
2—8 inch, 45 cal. (*A*).
8—6 inch, 45 cal.
22—12 pdr.
4—3 pdr.
Torpedo tubes:
2 *submerged*.

Armour (Krupp):
7″ Belt amidships) ... *a*
4″ Belt (forward) ..... *d*
2″ Armour deck ..... .
Protection to vitals = *aa*
3½″-2½″ Upper belt ... *e-f*
7″ Turrets..... *a*
″ Turret bases ..... .
3½″ Battery ..... *e*
6½″ Conning tower .. *a*

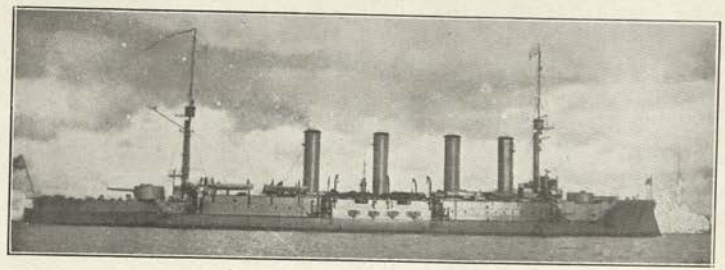


Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: 26 Belleville. Designed H.P. 16,500 = 21 kts. Coal: *normal* 750 tons; *maximum* 1020 tons.

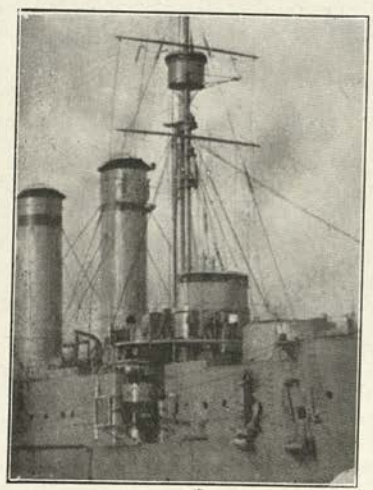
Armour Notes.—Belt is 6½ feet wide by 350 feet long; 4½ feet of it below waterline. Lower edge is 4″ thick.

Name.	*Built at*	*Laid down.*	*Completed.*	*Trials.*	*Boilers.*	*Present best speed.*
Ad. Makaroff	La Seyne	April '05	Dec., '07	19,000 = 22·55	Belleville	
Pallada	Galernli	1905	1910		Belleville	
Bayan	New Admiralty	1905	1910		Belleville	

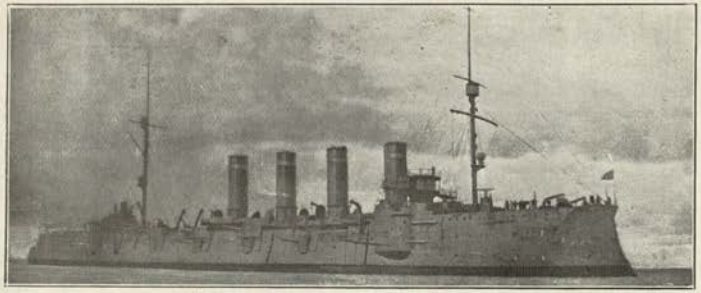
General Notes.—In design these ships very closely follow the original *Bayan* (now the Japanese *Aso*).



Bayan. *Photo, Oscar Parkes, Esq.*



Pallada. *Photo, Oscar Parkes, Esq.*

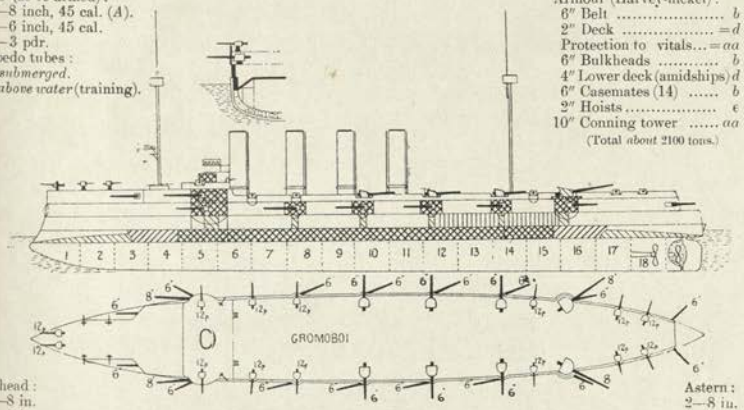


Громобой. **GROMOBOI** (May, 1899). *Photo, Oscar Parkes, Esq.*

Displacement, 13,200 tons. Wood sheathed and coppered. Complement, 800.
Length (*waterline*), 472½ feet. Beam, 68 feet. Draught, 27 feet.

Guns (as re-armed):
4—8 inch, 45 cal. (*A*).
22—6 inch, 45 cal.
4—3 pdr.
Torpedo tubes:
2 *submerged*.
2 *above water* (training).

Armour (Harvey-nickel):
6″ Belt ..... *b*
2″ Deck ..... =*d*
Protection to vitals... =*aa*
6″ Bulkheads ..... *b*
4″ Lower deck (amidships) *d*
6″ Casemates (14) ..... *b*
2″ Hoists ..... *e*
10″ Conning tower ..... *aa*
(Total *about* 2100 tons.)

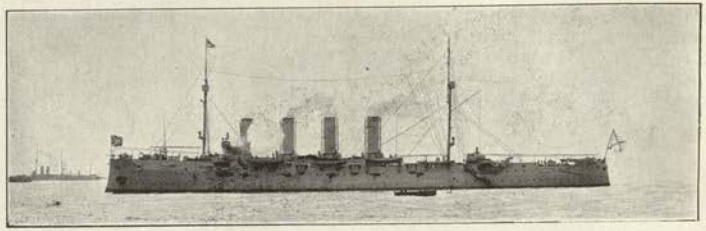


Ahead:
2—8 in.
4—6 in.

Astern:
2—8 in.
4—6 in.

Machinery: 3 sets triple expansion. 3 screws. Boilers: 30 Belleville. Designed H.P. 18,000=20 kts
Coal: *normal* 800 tons; *maximum* 2500 tons and liquid fuel.
Armour Notes.—Belt is 7 feet wide by about 330 feet long.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*First trials*	*Boilers*	*Best recent speed*
Gromoboi	Baltic Works	Baltic Works	May '98	Apl.'01	1907	=20·1	Belleville	18·5

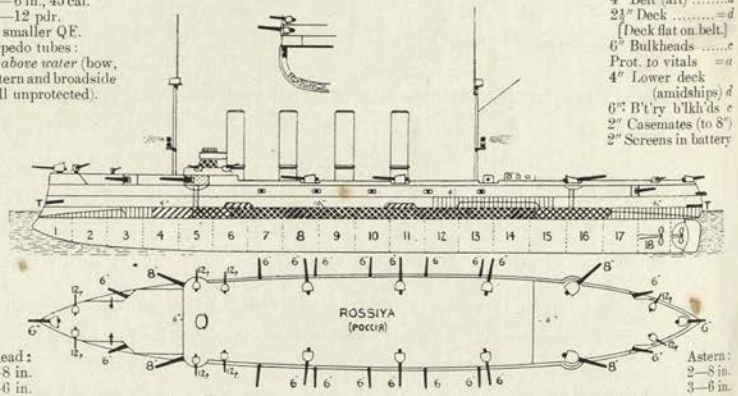


Россия **ROSSIYA** (May, 1896).

Displacement, 12,500 tons (sheathed and coppered). Complement, 735.
Length (*waterline*), 482 feet. Beam, 68 feet. *Maximum* draught, 26 feet.

Guns (as re-armed):
4—8 inch, 45 cal. (*A*)
22—6 in., 45 cal.
15—12 pdr.
36 smaller QF.
Torpedo tubes:
6 *above water* (bow, stern and broadside all unprotected).

Armour (Harvey):
10″-5″ Belt ..... *a-d*
4″ Belt (aft) ..... *d*
2½″ Deck ..... =*d*
[Deck flat on belt.]
6″ Bulkheads ..... *e*
Prot. to vitals =*a*
4″ Lower deck (amidships) *d*
6″ B't'ry b'lkh'ds *e*
2″ Casemates (to 8″)
2″ Screens in battery



Ahead:
2—8 in.
3—6 in.

Astern:
2—8 in.
3—6 in.

Machinery: 3 sets vertical triple expansion. 3 screws. Boilers (fitted 1907): 32 Belleville in 4 groups.
Designed H.P. 18,000=20 kts. Coal: *normal* 1000 tons; *maximum* 2500 tons and liquid fuel.
Armour Notes.—Belt is carried right aft, but incomplete forward. It is *about* 7 feet wide. 4″ armour in wake of engines. 6″ bulkheads protect battery from raking fire.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*First Trials (max.)*	*Boilers*	*Best recent speed*
Rossiya	Baltic Works	Baltic Works	1895	1898	1907	18,446=20·25	Belleville	18

Building.

SWIETLANA (*building*), *GREIG* (*building*), *BOOTAKOF* (*building*), *SPIRIDOF* (*building*).

Displacement, 6750 tons. Complement, .

Length, 507 feet. Beam, 50 feet. Draught, 18½ feet.

Guns:
12—6 inch
Torpedo tubes (18 inch):
submerged

Armour:
" Deck .....

Machinery:
Boilers: . Coal: *normal* tons; *maximum* tons. screws. Designed H.P. = kts.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Svietlana	Reval		'13				
Greig	Reval		'13				
Bootakoff	Putilov		'13				
Spiridoff	Putilov		'13				

Building.

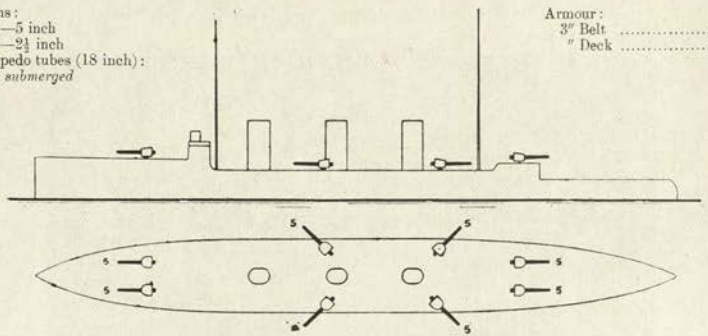
MOORAVIEV AMURSKY (1914), **NEVELSKOY** (1914).

Displacement, *about* 4500 tons. Complement, .

Length (*waterline*), 426½ feet. Beam, 46 feet. Draught, 17¾ feet.

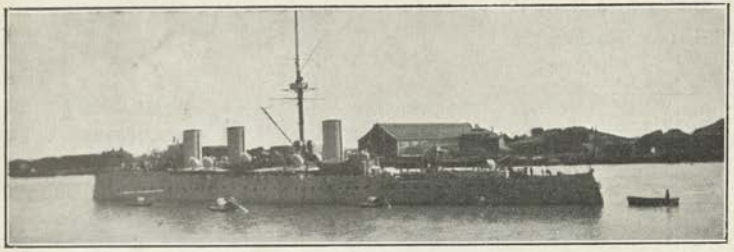
Guns:
8—5 inch
4—2½ inch
Torpedo tubes (18 inch):
2 *submerged*

Armour:
3" Belt .....
" Deck .....



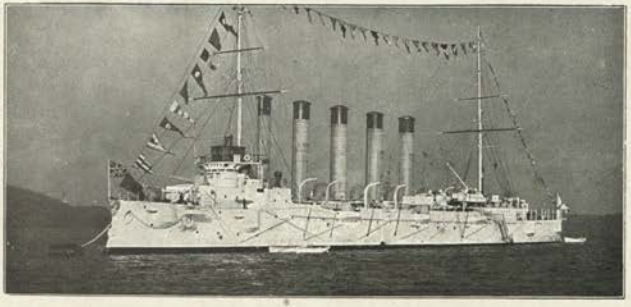
Machinery: Schichau turbines.
Boilers: . Coal: *normal* tons; *maximum* tons. screws. Designed H.P. 27,400 = 27½ kts.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
				To be			
M. Amursky	Schichau, Elbing	Schichau	Feb., '13	July, '14			
Nevelskoy	Schichau, Elbing	Schichau	Feb., '13	Oct., '14			

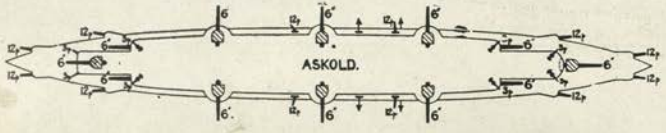


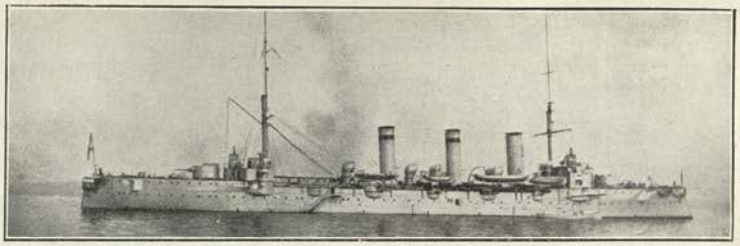
Photo, Lieut. O'Brien, R.N.

JEMTCHUG (Aug., 1903). 3050 tons. Complement, 334. Dimensions: 345 × 49 × *Mean* draught, 16 feet. Guns: 6—4·7 inch., 45 cal., 6—3 pdr., 2—1 pdr. Torpedo tubes (14 inch) *above water*: 4 broadside, 1 stern. Armour: 2″ Deck. Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 16 Yarrow. Designed H.P. 19,000 = 24 kts. Coal: 500 tons; *maximum* 600 tons.

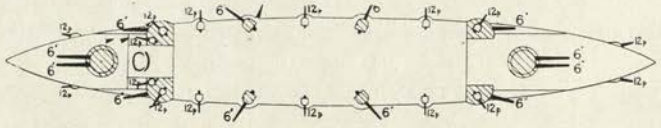


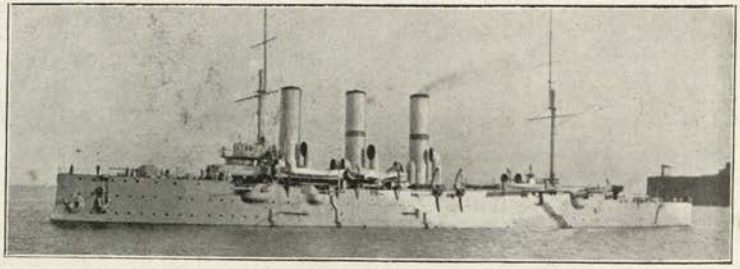
Аскольдъ. **ASKOLD** (April, 1900). 6500 tons. Complement, 580. Dimensions: 444 × 49 × *Maximum* draught, 20¾ feet. Armament: 12—6 inch, 45 cal., 12—12 pdr., 8—3 pdr., 2—1 pdr. Torpedo tubes (18 inch) 2 *submerged*, 4 *above water*. Armour: 3″ Deck, 4″ Funnel bases, 6″ C.T. Machinery: 3 sets triple expansion. 3 screws. Boilers: 18 Schulz-Thornycroft. Designed H.P. 19·500 = 23 kts. Coal: *normal* 720 tons; *maximum* 1000 tons. Bullivant net defence.



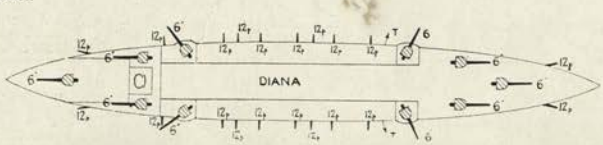


BOGATYR (January, 1901), **OLEG** (August, 1903). 6650 tons. Complement, 573. Dimensions: 433 × 54½ × 24¾ feet. Length *over all*, 440 feet. Armament: 12—6 inch, 45 cal., 12—12 pdr., 8—3 pdr., 2—1 pdr. Tubes (18 inch): 2 *submerged*, 2 *above water* (broadside), 1 ditto (bow), 1 (stern). Armour: 3″ Deck, 3″ Turrets, 3″ Casemates (4). Machinery: 2 screws. Boilers: Normand-Sigaudy. Designed H.P. 19,500 = 23 kts. Coal: *normal* 700 tons; *maximum* 1000 tons.

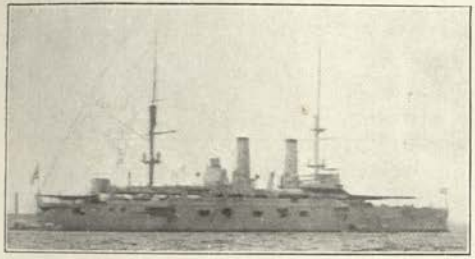




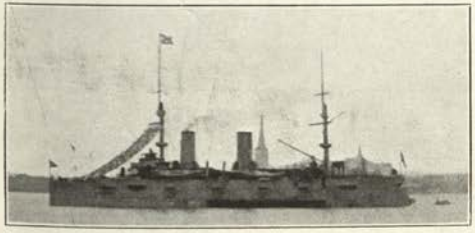
(Діана: Аврора.) **DIANA** (October, 1899) & **AURORA** (May, 1900). 7600 tons. Complement, 570. Dimensions: 410 × 55 × 21¼ feet. Armament: 10—6 inch, 45 cal., 22—12 pdr., 8 Small. Torpedo tubes (18 inch): 4 *above water*. Machinery: 3 sets horizontal 3 cylinder. Designed H.P 11,600 = 20 kts. 3 screws. Boilers: 24 Belleville. Coal: *normal* 900 tons; *maximum* 1430 tons + liquid fuel.



Gunnery School Ships.



IMPERATOR ALEKSANDR II. (1887). Displacement 9900 tons. Armament: 2—12 inch, 30 cal., 1—8 in., 10—6 in., 4—4·7 in., 4—3 pdr. Armour (Compound): Belt 14″-6″, Barbette 12″. Designed H.P. 8000 = 15·9 kts. Coal: 1200 tons.

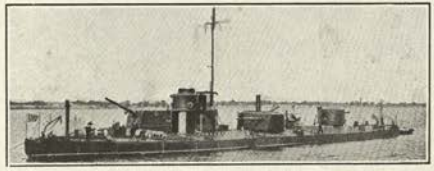


PETR VELIKY (1872) (reconstructed 1905). Displacement 9665 tons. Armament (new in 1905): 4—8 in., 10—6 in., 12—12 pdr., 4—6 pdr., 4—3 pdr., 2 machine. Coal: 1200 tons.

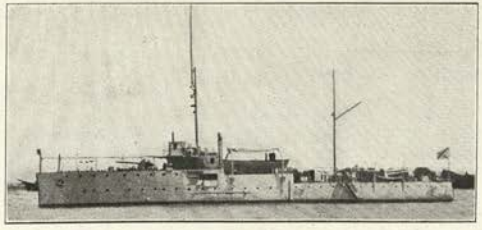
Despatch Vessels.

POSADNIK (1892) and **VOEVODA** (1893), 411 tons. Armament: 3—3 pdr., 3—1 pdr. Designed H.P. 3400 = 21 kts. Present speed considerably less.

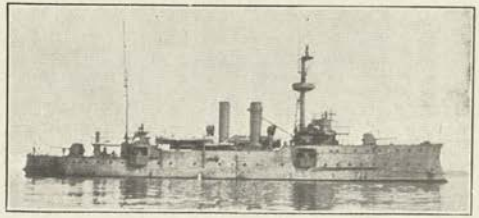
River Gunboats (*Amur*).



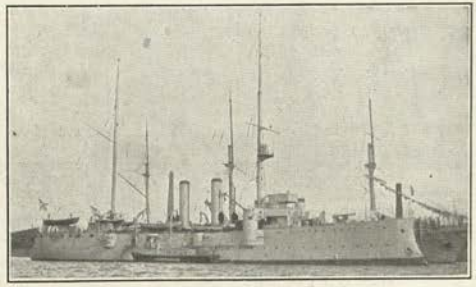
GROSA, SCHKWAL, SCHTORM, SMERTCH, TIFUN, URAGAN, WICHR, WYUGA (——1910). Displacement, 950 tons. Complement, . Length (*waterline*), 233 feet. Beam, 42⅛ feet. Draught, . Guns: 2—6 inch (one forward, one aft), 4—12 pdr. in pairs in midship turrets. Armour: 4½″ turrets. Machinery: Diesel motors. 1000 h.p. = 11 kts.



ARDAGAN (1909) & **KARS** (1909). 630 tons. Armament: 2—4·7 inch, 4—12 pdr. Machinery: Diesel motor. 1000 h.p. = 14 kts. (*Service on the Caspian*).

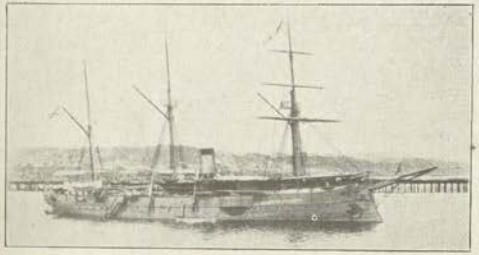


GILIAK (Oct., 1906), **KORIETZ** (1907), **SIVOUTCH** (1907), **BOBR** (1908). Displacement, 960 tons. Complement, 170. Guns: 2—4·7 inch, 4—12 pdr., 3 machine. Machinery: Triple expansion. 2 screws. Boilers: 4 Belleville. Designed H.P. 800 = 12 kts. Coal: 60 tons.



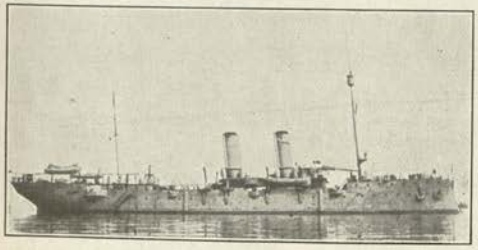
KHIVINETZ (1905). Displacement 1316 tons. Complement 200. Guns: 2—4·7 inch, 8—12 pdr., 2 machine. Machinery: Triple expansion. 2 screws. Boilers: 6 Belleville. Designed H.P. 1400 = 13 kts. Coal: 145 tons.

KHRABRY (1895). 1700 tons. Guns: 2—8 in., 45 cal. (A), 1—6 in., 45 cal., 5 small. Torpedo tubes: 1—14 in. (in bow). Armour: 5″ Harvey, waterline belt amidships. 3″ ditto aft. Designed H.P. 2460 = 14·5 kts. Niclausse boilers. Coal: *max.* 130 tons.



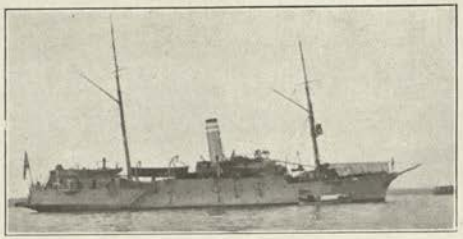
MANDJUR (1886). 1213 tons. Guns (old): 2—8 in., 1—6 in., 1—4 in. Designed speed: 13 kts. Coal: 250 tons. Complement: 160.

Mine Layers.



YENESEI (1906) & **AMUR** (1907). 3600 tons. Dimensions: 320×46×14½ feet. Armament: 5—4·7 inch, 2—12 pdr. H.P. 4700 = 17 kts. Boilers: 12 Belleville. Coal: 580 tons.

Mine Layers (*Continued*).



VOLGA (1896). 1452 tons. H.P. 1600 = kts. Babcock Boilers.

Special Service Vessels.

BAKANE (1896), 883 tons & **MOGUTCHI** (1893), 750 tons. Guns: 4—1 pdr.

ONEGA (*ex Gertzog Edinburgski*) (1875); **NAROVA** (*ex General Admiral*) (1873). 4600 tons.

LADOGA (*ex Minin*) 1869), (1878), (1899), (1909). 6200 tons. 10 kts.

Mine School Ships.

NIKOLAIEFF (1894). 14,000 tons. 13 kts.

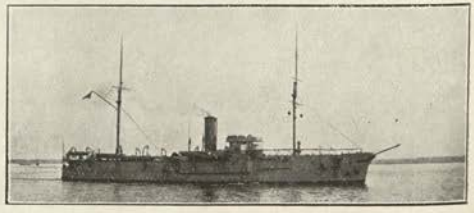
3 funnels, 2 masts. (see Silhouettes).

DWINA (*ex Pamiat Azova*) (1888) (1903). 6700 tons.

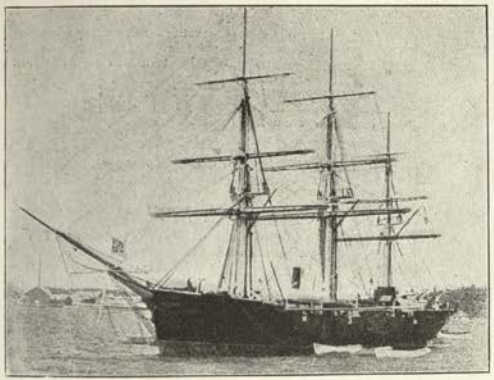
Training Ships.

OKEAN (Howalt, 1902). 12,000 tons. H.P. 11,000 = 18 kts. Boilers: 6 Belleville, 6 Niclausse, 3 Yarrow, 2 Thornycroft. Coal: 1600 tons. Complement 700. (*Engineers' Training Ship.*)

Mine Layer.



NAROVA.

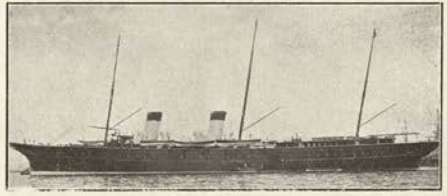


WIERNY (1895), & **VOIN** (1893), 1280 tons. Guns: 4—12 pdr. Speed, 9 kts. (*Wierny* has a bigger funnel than *Voin*).

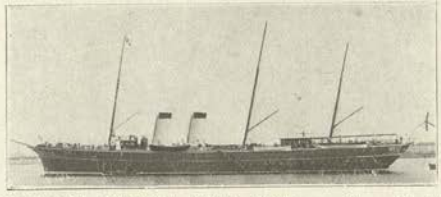
Imperial Yachts.

Paddle Yacht.

ALEXANDRIA (1903). 500 tons. 14·5 kts.



STANDART (1895). 5557 tons. Guns: 8—3 pdr. H.P. 10,600=21 kts. Belleville boilers.



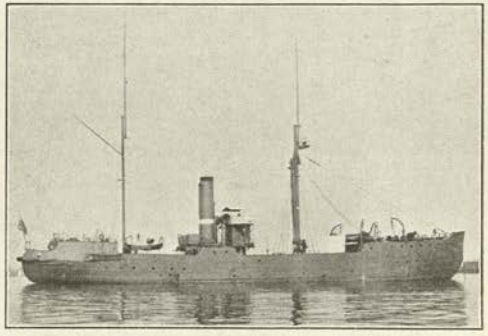
POLARNAIA-SVIEZDA (1890). 3640 tons. Guns: 6—12 pdr. H.P. 5,600=18·8 kts. Cylindrical boilers.
There are also 8 small Imperial Yachts of from 800—180 tons.

Ice Breakers.

ERMACK (Newcastle, 1898). 8000 tons, Dimensions, 305×71×25 feet. H.P. 10,000= kts. Coal: 3000 tons.

NADIEJNY (Copenhagen, 1897). 1500 tons. Dimensions: 195×43×18 feet. H.P. 3600=14·75 kts.

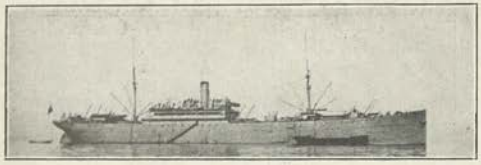
Special Colliers.



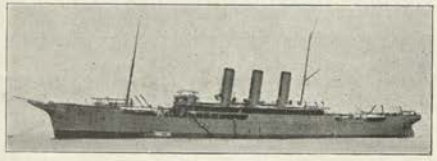
SUCHON (1910), **PETSCHORA** (1910), **MESEN** (1912). 2000 tons.

Special Service Vessels.

OKA (1910), & **KAMA** (1910).

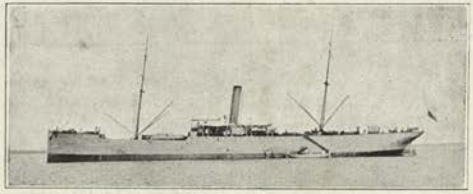


RIGA (Blohm & Voss, 1899). 14,500 tons.



ANGARA (Clydebank, 1898), (*ex Anegawa Maru, ex Angara*). 11,700 tons. H.P. 12,500 = 20 kts. Belleville boilers. Captured in the war. In 1911, presented to Russia by the Emperor of Japan.

XENIA (1900). 6000 tons.

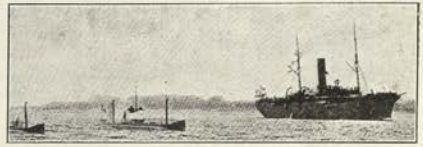


BORGO & **LACHTA.** 5000 tons.

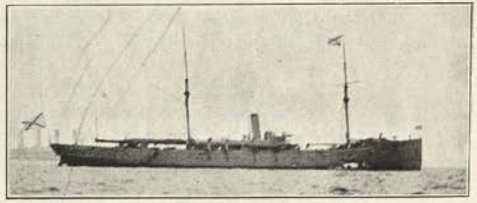
ANADYR. 10,000 tons.

TAIMYR & **WAIGATSCH.** 1300 tons. (Special for the Arctic.)

Submarine Tenders.

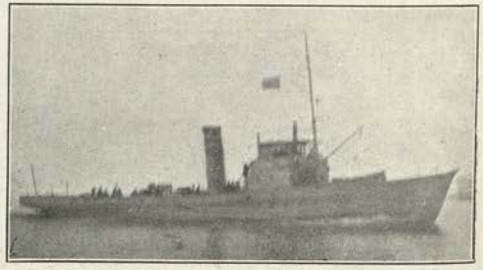


CHABAROVSK (1895). 2800 tons. 12·5 kts.



EUROPA (1878). 3200 tons. 13 kts.

Mine Sweeper.



MINREP. (Now has a main mast).

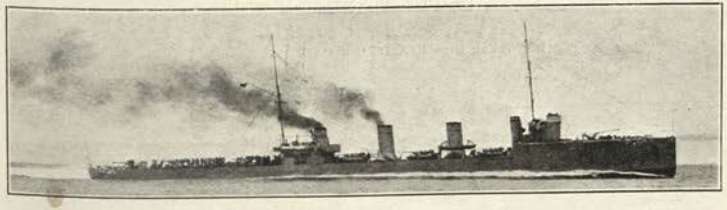
80+36 RUSSIAN BALTIC DESTROYERS (*Eskadrenny Minonossetz* if over 400 tons, *Minonossetz* if under).

Summary of Russian Destroyers.

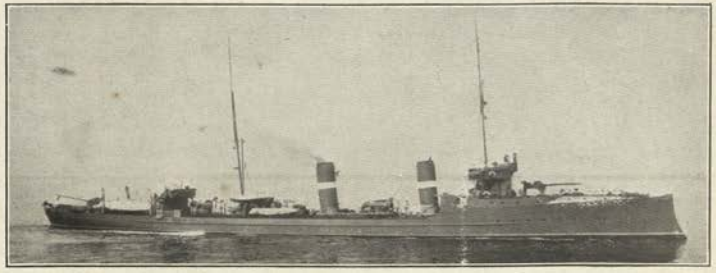
No.	Type.	Displacement.	Date.	H.P.	*Max.* Speed.	Coal.	Complement.	Tubes.	*Max.* Draught.	Armament.
						tons.				
36	*New boats*	...	'12-'14	...	...	...	...	...	...	...
1	Novik	1262	'10-'12	40,000	36 (*t*)	...	...	4	10½	4—4·1 inch, 4 machine
4	Kondratenko...	625	'05-'06	7300	25	191	100	3	9½	2—4 inch, 1—1 pdr.
4	Emir Bucharski	580	'05-'06	6500	26	134	98	3	8½	2—4 inch, 1—1 pdr.
4	Amuretz (G)	560	'05-'06	6500	26	180	98	3	9	2—4 inch, 1—1 pdr.
8	Strashni.....	508	'04-'06	5200	27	134	90	3	9	2—4 inch, 1—1 pdr.
10	Boyevoi (S) ..	375	'05-'06	6000	26	95	95	3	7	2—12 pdr., 4 machine
8	Dyelny	356	'05-'06	6200	27	57	62	2	7	2—12 pdr., 6 machine
6	Bravy.....	356	'02-'04	5700	26	80	62	3	7	1—12 pdr., 5—3 pdr.
3	Bestraschni (S)	352	'00-'01	6000	27	60	60	3	8½	1—12 pdr., 5—3 pdr.
11	Lowki (F)	335	'04-'05	6000	26	80	53	2	7	2—12 pdr., 6 machine
5	Twerdi *	300	'05-'06	3800	25	...	...	2	7	1—12 pdr., 3—3 pdr.
8	Smyeli (Y)* ...	245	'01-'03	5700	27	53	53	2	9	1—12 pdr., 5—3 pdr.
2	Grosovoi (F)*	312	'00-'01	4750	26	80	53	2	8	1—12 pdr., 5—3 pdr.
6	Pritki (Y) * ...	220	'95-'00	3800	28	60	51	2	8	1—12 pdr., 3—3 pdr.

Y = Yarrow type. F = French type (Normand or Forges et Chantiers). G = Germania (Krupp). S = Schichau.
*These are officially rated with torpedo boats.

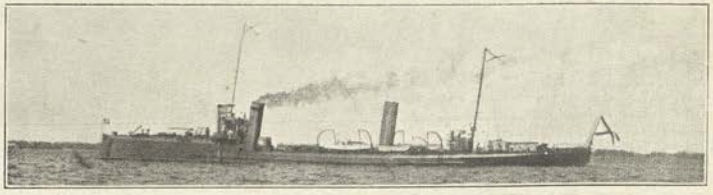
The 36 new boats *Novik* type are named: ***Axard, Avtroil, Briatschislaw, Cap. 2r. Kern, Cap. 2r. Kinsbergen, Cap. 2r. Konon-Zotof, Cap. 2r. Krown, Cap. 2r. Tsylmettiev, Chios, Desna, Gavrill, Grom, Grengamn, Gogland, Koolm, Konstantin, Lieut. Belle, Lieut. Doobassov, Lieut. Iliin, Lieut. Lombardo, Lietoon, Michail, Orphey, Patrass, Pobieditel, Priamishaw, Rymnick, Ssamson, Ssmolensk, Ssokol, Stiressooden, Tenedoss, Theodor Sstratilat, Wladimir, Zabiaka.***



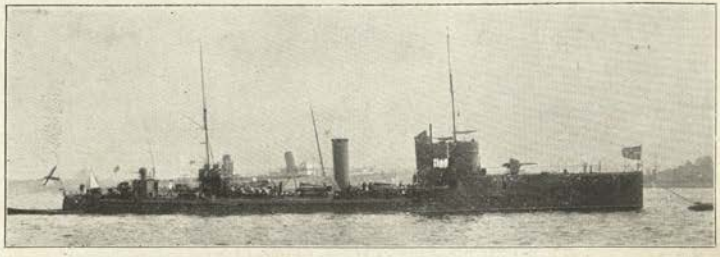
Novik (1911). Dimensions: 335×31×10¼ feet. Turbine and oil fuel only. Armament: 4–4·1 inch, 4 machine, 4–18 inch tubes.



4 "*Kondratenko type*" named ***Kondratenko, Sibriski-Strelok, Ochotnik, Pogranitschisk.***
Dimensions: 247×26×8¼ *mean* feet.



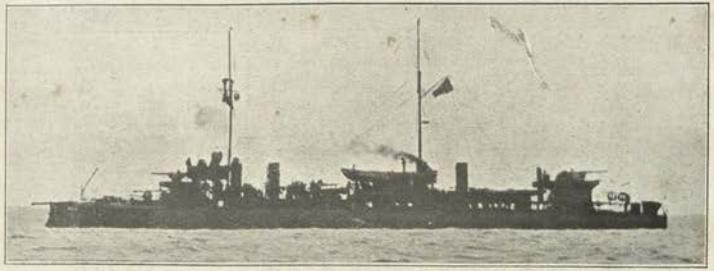
4 "*Emir Bucharski*" *type* named ***Emir Bucharski, Dobrovoletz, Finn, Moskwityanin.***



4 "*Amuretz*" *type* named ***Amuretz, Gaidamak, Vsadnik, Ussurietz.***

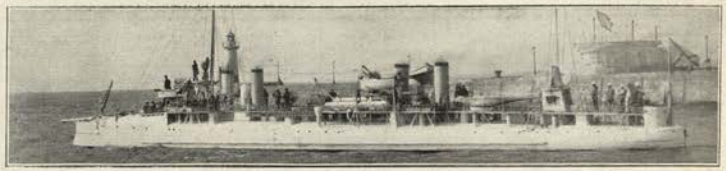
Photo, Sterutz

10 "*Boyevoi*" *type* named **Boyevoi, Bditelni, Burni, Leit. Sergieff, Kapitan-Jurassowski, Insch. Mech. Swereff, Insch. Mech. Dmitrieff, Vnimatelni, Vnuschitelni, Vinoslivi.**
3 "*Bestraschni*" *type* named **Bestraschni, Besposchtschadni, Beschumni.**



11 "*Lowki*" *type* named **Legki, Letutschi, Lowki, Leit. Bourakoff, Likoi, Iskussni, Ispolnetelni, Krepki, Metki, Molodetski, Moschtschny.**

8 "*Dyelni*" *type* named **Dyelni, Dostoini Dyejatelni, Rastoropni, Rasyaschtschi, Silni, Stroiny, Storoschevoi.**
6 "*Bravy*" *type* named **Bravy, Boiky, Bodry, Grosny, Gromyastchy, Vidny** (*with bow tube*).
10 "*Tverdi*" *type* named **Leit. Malejeff, Insch. Mech. Anastassoff, Twerai, Totschni, Trevoschni.**
9 "*Smyeli*" *class* named **Smyely, Serdity, Statny, Skory, Retivy, Ryasvy, Ryany, Prosorlivy.**
6 "*Pritki*" *type* named **Pritky** ex *Sokol*), **Protschny, Poavischny, Pronsitelny, Poraschamschtshy, Posluschny.**



2 "*Grosovoi*" *type* named **Grosovoi, Vlastni.**

8 "*Strashni*" *type* named **Donskoi-Kasack, Kasanets, Steregouchi, Strashni, Turkmenets-Stavropolsky, Ukraïna, Voiskovoi, Zabaikaletz.** (3 funnels).

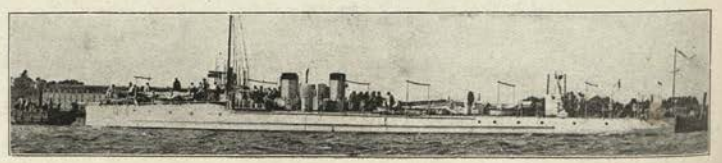
16 RUSSIAN (BALTIC) + 2 (SIBERIAN) TORPEDO BOATS.

No.	Type	Date	Displacement tons	H.P.	*Max.* speed kts.	Fuel tons	Complement	T. Tubes	*Max.* draug't
1	*Lastochka* (Y)	1904	200	(*t*)	30	...	...	3	...
2	213—212 (Y)	1902	186	2500	24	50	...	3	...
8	214—220 (N)	1902-3	150	1300	30	40	...		...
	222								
5	142, 140, 134, 129, 128 (N)	1894-8	120	2000	21	20-40	...	3	...

(Y)=Yarrow. (N)=Normand. (*t*)=turbine.

Siberian Flotilla.

2 old *Selichau* (206 and 205), dating from 1889. 85 ton type.



Normand boats.

RUSSIAN SUBMARINES. (*Podwodnia Lodka*).

13 + *13* Baltic Submarines.

No.	Type	Date	Dis-placement	H.P.	*Max.* speed	Fuel	Com-plement	T. tubes	*Max.* draug't
					kts.	tons			*sub.*
12	*New* (A)	*bldg.*	...	...	...	...	...	...	...
1	*New* boat	*bldg.*	500	...	$16\frac{1}{2}$	...	...	2	...
1	*Akula* (B)	1903	370	...	...	...	...	2	11
1	*Posehtovi*	1908	134	...	...	...	...	...	...
1	*Minoga* (B)	1908	126	...	...	...	...	2	8½
4	*Alligator* (L)	1908	$\frac{450}{500}$	...	$15\frac{1}{2}$	...	...	4	13
2	*Makrel* (B)	1907	$\frac{150}{200}$	...	$\frac{8}{6}$	...	...	4	9
1	*Sig* (L)	1905	$\frac{135}{175}$	...	$\frac{10}{7}$	...	...	3	11½
3	*Sterliad* (H)	1904	$\frac{115}{150}$	160	$\frac{9\frac{1}{2}}{7}$	...	...	2	11

(B) = Bubnoff. (L.) = Lake. (H) = Holland.

The 12 new boats: ***Jaguar, Kaguar, Leopard, Lwiza, Pantera, Ryss, Tigr, Tur, Baro, Gepard, Vyopr, Wolk.***

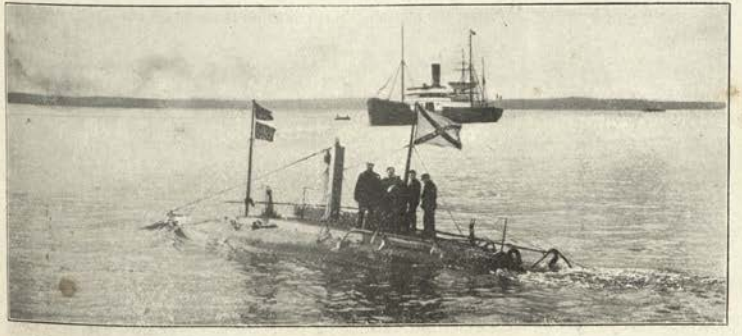
Makrel class, named ***Makrel, Okun.***

12 + *6* Siberian Flotilla.

No.	Type	Date	Dis-placement	H.P.	*Max.* speed	Fuel	Com-plement	T. tubes	*Max.* draug't
						tons			feet
6	*New*	*bldg.*	...	...	...	...	...	...	...
5	*Ossetyr* (L)	1904-5	$\frac{135}{175}$	...	$\frac{10}{7}$	...	...	3	11½
2	*Som* (H)	1904	$\frac{115}{150}$	160	$\frac{9\frac{1}{2}}{7}$	..	..	2	11
4	*Makrel* (B)	1904	$\frac{150}{200}$	...	$\frac{8}{6}$	...	...	4	9
1	*Delfin*	1903	$\frac{115}{150}$	120	$\frac{6\frac{1}{2}}{6}$	...	...	2	10

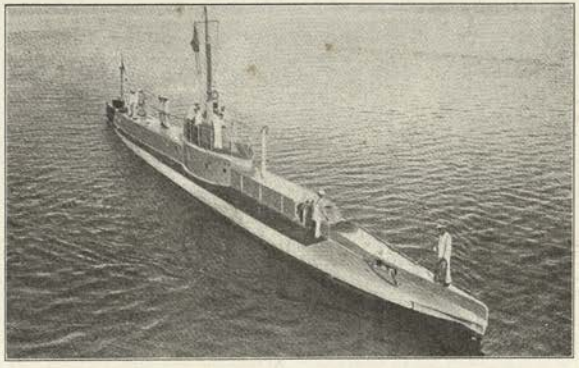
(B) = Bubnoff (L.) = Lake. (H) = Holland.

Makrel type, named ***Graf Sheremetyeff, Nalim, Kassatka, Skat.***

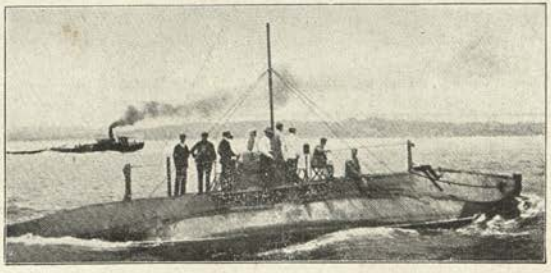


DELFIN.

Sig.



Alligator class, named ***Alligator, Drakon, Kaiman, Krokodil.*** *Photo, Alan H. Burgoyne, Esq M.P.*
Ossetyr (ex Protector) type, named ***Ossetyr, Bytschok, Kefal, Paltus, Plotwa.***



HOLLAND TYPE.

Sterliad class, named ***Sterliad, Byaluga, Peskar.***
Som type, named ***Som, Schtschuka.***

RUSSIAN BLACK SEA FLEET.

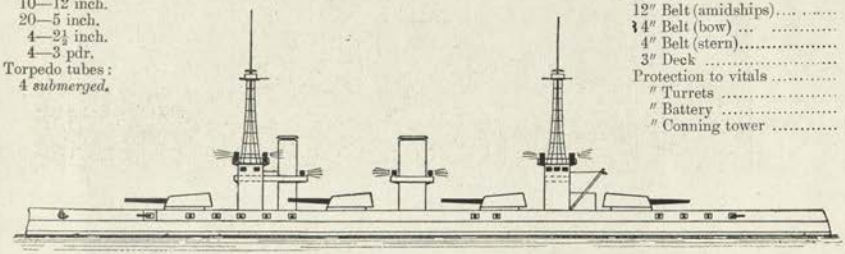
1911 DREADNOUGHTS. Nos. **1, 2, 3.**

EKATERINA II (1914), *IMPERATRIZA MARIA* (1914), *ALEXANDER III* (1914).

Displacement, 22,500 tons. Complement, .

Length, 551 feet. Beam, 89¾ feet. *Mean* draught, 27¾ feet.

Guns:
10—12 inch.
20—5 inch.
4—2½ inch.
4—3 pdr.
Torpedo tubes:
4 *submerged*.



Armour:
12″ Belt (amidships)
4″ Belt (bow)
4″ Belt (stern)
3″ Deck
Protection to vitals
″ Turrets
″ Battery
″ Conning tower

Note.—9 cruisers projected to follow these ships.

Machinery: Turbine. 4 screws. Designed H.P., 25,000=21 kts. Coal: *normal*, tons. *maximum*, tons.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Trials.*	*Turbines.*	*Boilers.*	*Best recent speed.*
Ekaterina II	Sevastopol (V)		Oct. '11	*to be in* 1914				
Imp. Maria	Nikolaieff (B)		Nov. '11					
Alexander III	Nikolaieff (B)							

V=Franco-Belgian—Vickers (Barrow). B=Bunge & Ivanoff—Brown (Clydebank).

RUSSIAN BLACK SEA FLEET.

1903 BATTLESHIPS. **1898**

IEVSTAFI CLASS—(3 SHIPS).

IEVSTAFI (Nov., 1906) & **IOANN ZLATOUST** (May, 1906),
PANTELIMON (Ex. K. P. Tavritchesky) (Oct., 1900).

Displacement, 12,800 tons. Complement, 731.

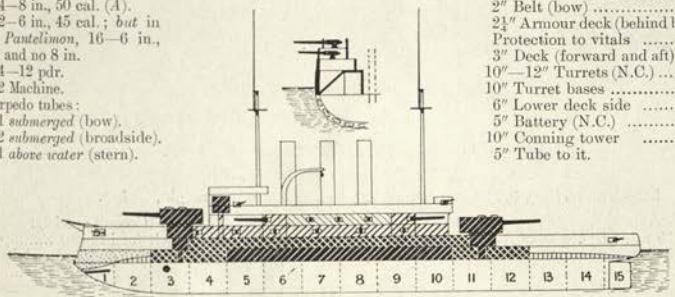
Length (*waterline*), 366 feet. Beam, 74 feet. *Maximum* draught, 28 feet.

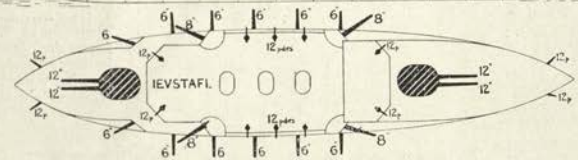
Guns:
4—12 in., 40 cal. (A^4).
4—8 in., 50 cal. (*A*).
12—6 in., 45 cal.; *but* in *Pantelimon*, 16—6 in., and no 8 in.
14—12 pdr.
2 Machine.

Torpedo tubes:
1 *submerged* (bow).
2 *submerged* (broadside).
1 *above water* (stern).

Armour (Krupp):

9″—7″ Belt (amidships)	*aa-a*
2″ Belt (bow)	*f*
2¼″ Armour deck (behind belt) Protection to vitals	= *aaa*
3″ Deck (forward and aft)	
10″—12″ Turrets (N.C.)	*aa*
10″ Turret bases	*aa*
6″ Lower deck side	*a*
5″ Battery (N.C.)	*c*
10″ Conning tower	*aa*
5″ Tube to it.	





Ahead:
2—12 in.
2—8 in.
2—6 in.

Astern:
2—12 in.
2—8 in.
2—6 in.

Broadside: 4—12 in., 2—8 in., 6—6 in.

Machinery: 2 sets vertical triple expansion. Designed H.P. 10,600 = 16 kts. 2 screws. Boilers: 22 Belleville in groups, placed longitudinally. Coal: *normal* 670 tons and 580 tons of naphtha; double bottom fitted to take 200 extra tons of coal.

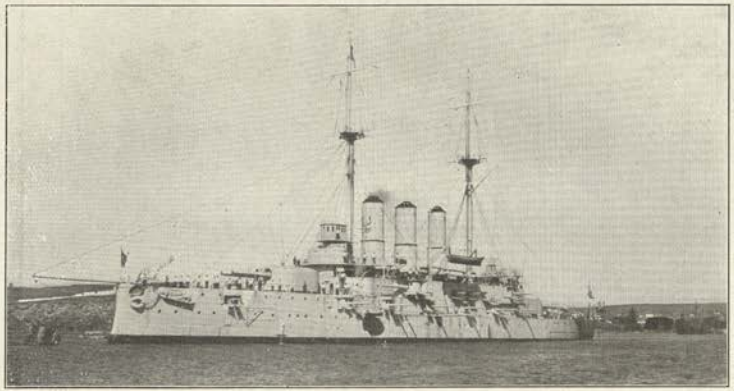
Armour Notes.—Belt is 7½ feet wide by 237 feet long, 4½ feet of it below waterline. Lower edge is 5″ thick.

Gunnery Notes.—Loading positions, big guns: all round. Hoists, electric. Big guns manœuvred electrically. Balanced turrets.
Arcs of fire: Fore 12 in. turret, 200°; after turret, 240°; 8 in. guns, 135°; broadside 6 in., 115°; end ones, 135°; 12 pdr. in battery, 90°; those at ends of superstructure, 100°; those at bow and stern, 120°.

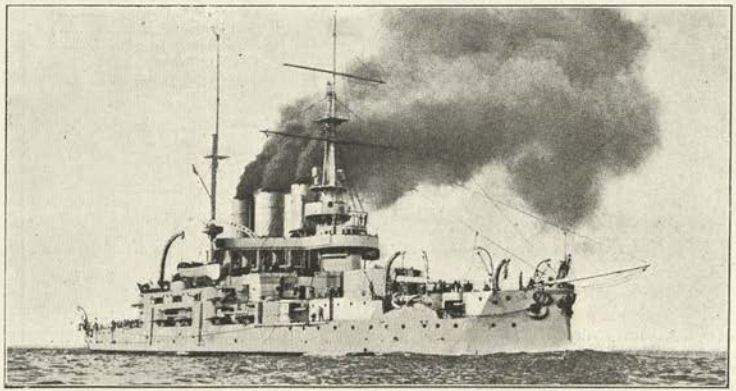
Torpedo, &c., Notes.—Bow tube somewhat uncertain. 6 searchlights.

Engineering Notes.—Machinery, &c., made by Société Anonyme des Chantiers Navales de Nikolaieff.

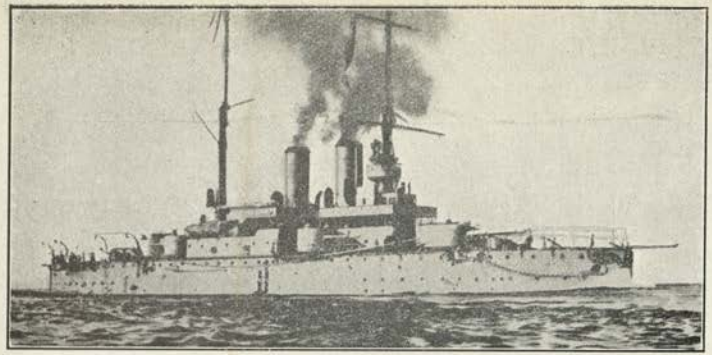
Name.	*Built at.*	*Laid down.*	*Completed.*	*Trials*	*Boilers.*	*Best recent speed.*
Ievstafi	Nikolaieff	1903	1910		Belleville	
Ioann Zlatoust	Sevastopol	Nov., '03	1910		Belleville	
Pantelimon	Nikolaieff	1898	1903	11,300 = 16·7	Belleville	



IOANN ZLATOUST (AND IEVSTAFI). *Photo by favour of Kapitan Ketlinsky.*



PANTELIMON.



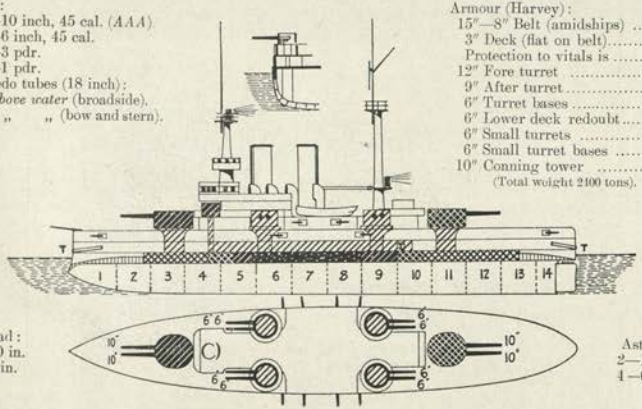
Ростиславъ **ROSTISLAV** (Sept., 1896).

Displacement, 9000 tons. Complement, 631.

Length (*waterline*), 341 feet. Beam, 69 feet. *Mean* draught, 25 feet. Length *over all*, 348 feet.

Guns:
4—10 inch, 45 cal. (*AAA*).
8—6 inch, 45 cal.
12—3 pdr.
4—1 pdr.
Torpedo tubes (18 inch):
4 *above water* (broadside).
2 „ „ (bow and stern).

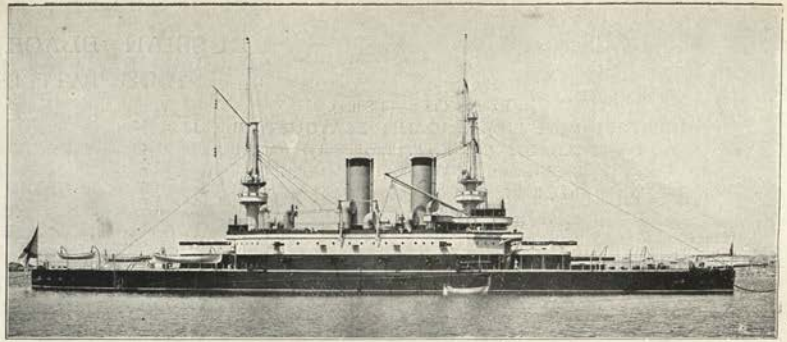
Armour (Harvey):
15″—8″ Belt (amidships) ...*aaa-b*
3″ Deck (flat on belt).....
Protection to vitals is .....*aaa*
12″ Fore turret .....*aa*
9″ After turret ..... *a*
6″ Turret bases .....*c*
6″ Lower deck redoubt.....*c*
6″ Small turrets .....*c*
6″ Small turret bases .....*c*
10″ Conning tower .....*a*
(Total weight 2100 tons).



Ahead:
2—10 in.
4—6 in.

Astern:
2—10 in
4—6 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: Belleville. Designed H.P. 8500=16 kts. Liquid fuel also carried. Coal: *normal* 500 tons; *maximum* 800 tons.
Armour Notes.—Belt is 7 feet wide by 274 feet long; 5 feet of it below waterline; lower edge is 8″ thick.
Gunnery Notes.—Loading positions, big guns: all round. Hoists, electric and hand. Big guns manœuvred electrically. Secondary turrets, electric and hand. Arcs of fire: Big guns, 240°; small, 110°.
Engineering Notes.—On trial burning petroleum she made 18 kts. Coal consumption heavy.
General Notes.—Laid down at Nikolaieff, 1895, and completed for sea 1898. Cost about £850,000.



(Before reconstruction). *Photo by favour of H.I.H. Grand Duke Alexander of Russia.*

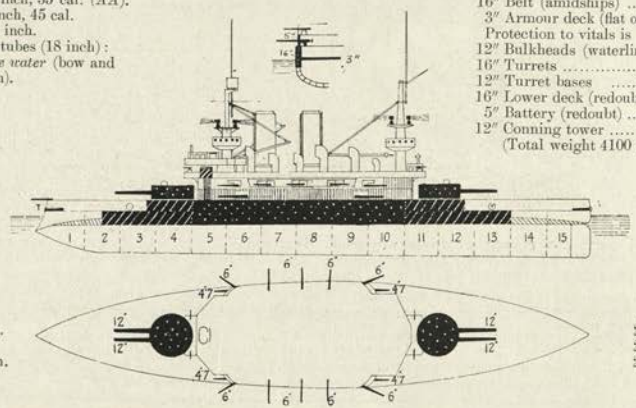
Три Святителя **TRI SVIATITELIA** (Nov., 1893).

Displacement, 12,540 tons. Complement, 731.

Length (*waterline*), 377½ feet. Beam, 72½ feet. *Maximum* draught, 29 feet.

Guns:
4—12 inch, 35 cal. (*AA*).
10—6 inch, 45 cal.
4—4·7 inch.
Torpedo tubes (18 inch):
2 *above water* (bow and stern).

Armour (Creusot special):
16″ Belt (amidships) ..... *aaa*
3″ Armour deck (flat on belt).
Protection to vitals is ..... *aaa*
12″ Bulkheads (waterline).... *aa*
16″ Turrets ..... *aaa*
12″ Turret bases ..... *aa*
16″ Lower deck (redoubt) ... *aaa*
5″ Battery (redoubt) ..... *d*
12″ Conning tower ..... *aa*
(Total weight 4100 tons).

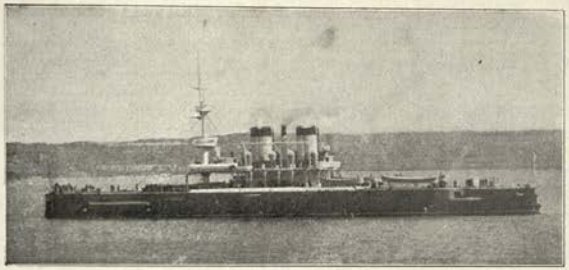


Ahead:
2—12 in.
2—6 in.
2—4·7 in.

Astern:
2—12 in.
2—6 in.
2—4·7 in.

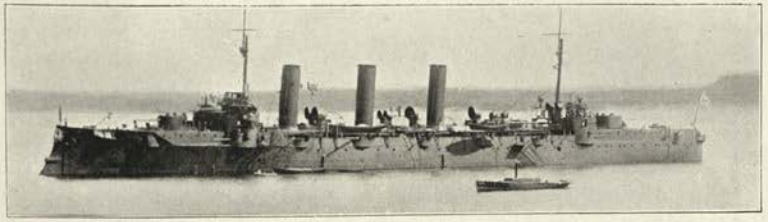
Machinery: 2 sets triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. 10,600=18 kts. Coal: *normal* 750 tons; *maximum* 1,000 tons.
Armour Notes.—Main belt 8 feet wide by 288 feet long, 6 feet of it below waterline.
Gunnery Notes.—Loading position, big guns: end on. Hoists, electric. Big guns manœuvred, electrically and hydraulic. Arcs of fire: Big guns, 270°; amidships 6 in, 100°; end ones, 140°.
Trials.—On a 12 hour *normal* draught trial she made I.H.P. 11,400=17·7 kts.; *Full* draught not tried.
General Notes.—Built at Nikolaieff at a total cost of about £1,200,000. Laid down August, 1891, and completed 1897-98. Engined by Humphrys and Tennant.

Old Battleship.

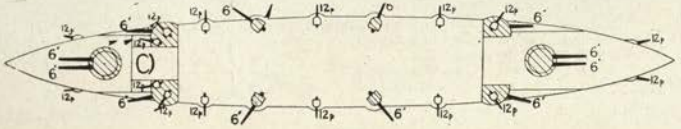


GEORGI POBIEDONOSETS (1892). 10,250 tons. Complement, 560. Dimensions: 339×69×29 feet. Armament: 6—old 12 inch, 7—6 inch, 8—12 pdr. Tubes: 7 *above water*. Armour (compound): 16″—10″ Belt, 12″ Redoubt. Designed H.P. 13,000=16·5 kts. Coal: *max.* 870 tons.

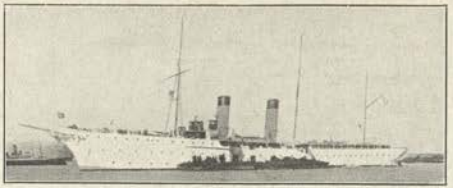
Protected Cruisers.



KAGOUL (*ex Otchakov*) (October, 1902), **PAMIAT MERKOORIA** (*ex Kagoul*) (June, 1903). 6750 tons. Complement, 573. Dimensions: 436 × 54 × 20½ feet. Armament: 12—6 inch, 12—12 pdr., 7 small. Tubes (18 inch): 2 *submerged*, 1 bow and 1 stern (*above*). Armour: 3″ Deck, Turrets, and Casemates (4). Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: Belleville. Designed H.P. 19500=23 kts. Coal: *normal* 700 tons; *maximum* 1100 tons. Carry 200 rounds per gun. Electric hoists.



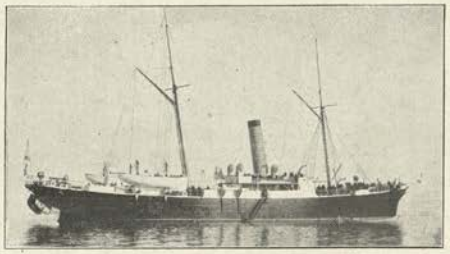
Armed Yacht.



ALMAZ (1903). 3300 tons. Complement, 275. Dimensions: 363×43½×17½ feet. Guns: 4—12 pdr., 4—3 pdr. Armour: 3″ deck over machinery. Designed H.P. 7500=19 kts. Belleville boilers. Coal: 560 tons.

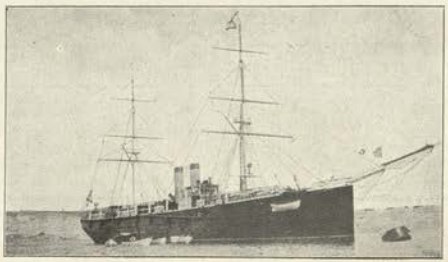
Mine Layers.

PROOT (*ex Moscwa*, of the Volunteer Fleet). 5500 tons. Armament: 8—3 pdr., 2—1 pdr. Speed: 12 kts.

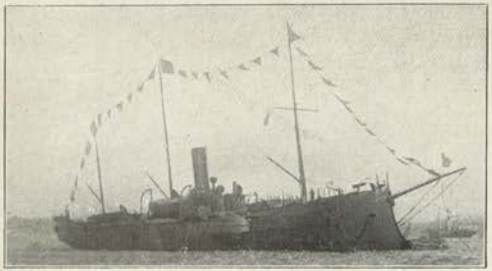


DUNAI (1891). 1360 tons. Speed: 14 kts.

Torpedo School Training Ship.



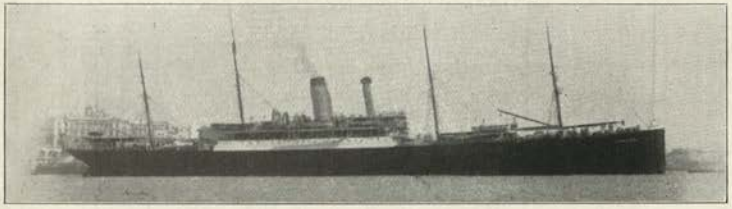
BERESAN (1870). 3050 tons.



Gunboats.

There are also 4 gunboats of 1200 tons, carrying 2—6 inch, 45 cal. and 1—4·7 inch, 45 cal. 2—12 pdr., 4—3 pdr., 2—1 pdr. **DONETS, URALETS, TERETS** and **KOUBANETS**—launched 1887, but rearmed and reboilered with Bellevilles, 1904-06.

Repair and Depot Ship.



KRONSTADT. Repair ship for Black Sea Fleet. 16,000 tons. 13 kts.

26 Black Sea Destroyers.

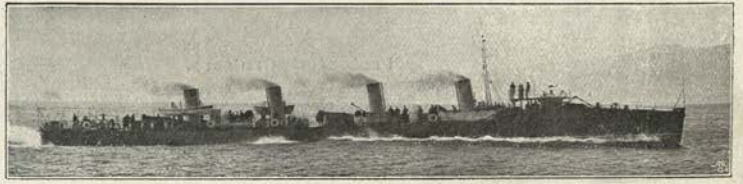
No.	Type	Date	Displacement	H.P.	Speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			
9	*Bistry*	'11—'14	1050	22,500	33 (*t*)	...	...	3	...
4	*Baranoff*	'05—'08	600	6500	26	200	85	3	10
9	*Zavidny*	'03—'06	350	5500	27	80 *oil*	64	2	8½
4	*Strogy*	'00—'02	240	3800	26	60 c. & o.	56	2	8

RUSSIAN BLACK SEA DESTROYERS.

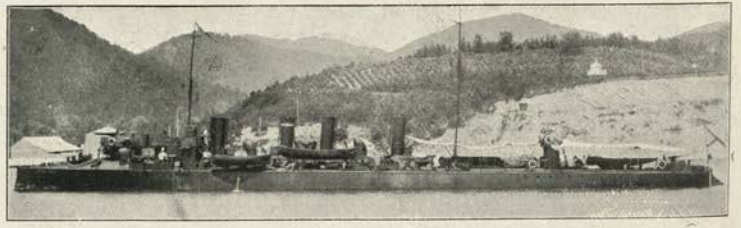
9 boats (1912-13), named:—***Bistry, Bespokoiny, Dersky, Gnievny, Gromky, Pospyechny, Pronsitelny, Pulky, Stschastliry,*** 1050 tons. Armament: 2—4 inch 5—12 pdr., 3—18 inch tubes. 22,500 H.P. =33 kts. Parsons turbine.

2 funnels.

4 boats (1907). ***Kap. Leit. Baranoff, Leit. Shestakof, Kapitan Saken*** (*ex Pushkin*), ***Leit. Zatzarennyi.*** 570 tons. H.P. 6500=26 kts. Armament: 1—4·7 inch, 5—12 pdr., 3—18 inch tubes. Coal and oil: 200 tons.



9 boats (Laird type). ***Zavidny, Zavetny, Jeevoi, Jeevootchy, Jootky, Jarky, Zvonky, Leit. Pushtscheen*** (*ex Sadorny*), ***Zorky*** (1903). 350 tons. H.P. 5500=27 kts. Boilers: Normand. Carry 80 tons, oil fuel. Armament: 1—12 pdr., 5—3 pdr., 2 tubes (18 inch). *Maximum* draught: 8½ feet.

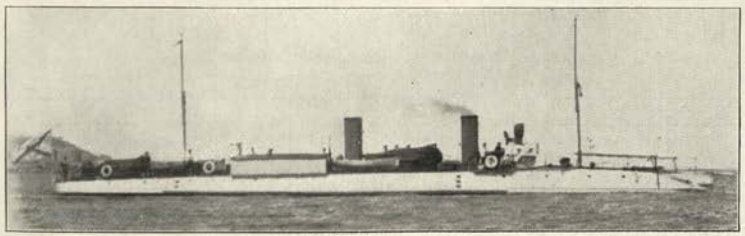


4 boats (early Yarrow type). ***Strogy, Smetlivy, Stremitelny, Svirepy*** (1901). 240 tons. H.P. 3800=26 kts. Boilers: Yarrow. Carry 60 tons, coal or oil. Armament: 1—12 pdr., 3—3 pdr., 2 tubes (18 inch). *Maximum* draught: 8 feet.

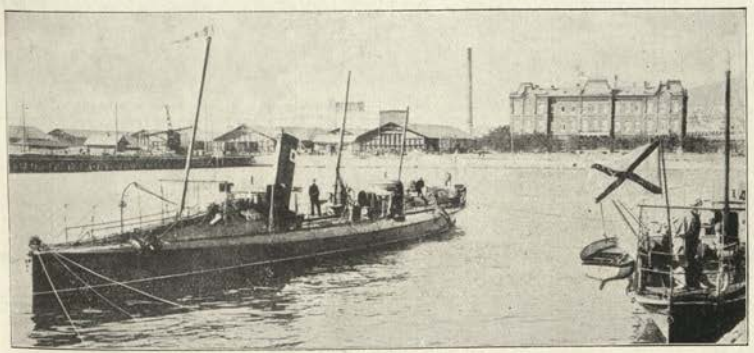
10 Torpedo Boats.

No.	Type	Date	Dis-placement	H.P.	*Max.* speed	Fuel	Comple-ment	T. tubes	*Max.* draug't
4	273—270 (N)	'95—'96	tons 120	2000	kts. 21	tons 20 coal	...	3	...
	256, 253 & 252, 263, 260, 259 (S)	'95—'86	104	1000	17	17 coal	...	2	...

(N)=Normand. (S)=Schichau.
There are also a certain number of very old second class boats.



Normand boats: ***273—270.***



Schichau boats.

11 Submarines (Black Sea Flotilla).

No.	Type	Date	Dis-placement	H.P.	*Max.* speed	Fuel	Comple-ment	T. tubes	*Max.* draug't
6	*Kaschalot* (B)	'09—'12	tons 450	...	kts. 450	tons ...	...	...	...
1	*Krab*	1910	400	...	...	...	...	...	...
2	*Karp* (G)	1907	300 / 240	...	10 / 8	for 1800 miles	...	1	...
1	*Sudak* (H)	1907	115 / 150	...	9 / 6	...	...	2	...
1	*Losos* (H)	1907	120 / 150	...	9 / 7	...	...	2	...

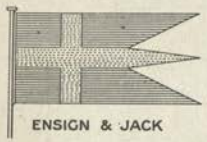
(B)=Bubnolf. (G)=Germania (Krupp). (H)=Holland

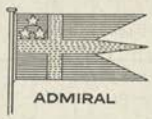
6 *Kaschalot* class, named:—***Kaschalot, Kit, Morsch, Narval, Nerpa, Tyulen***—also ***Krab.***

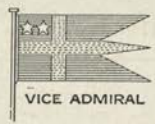
GERMANIA TYPE.

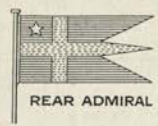
Karp class, named ***Karp, Karas.***

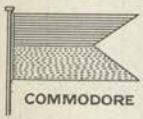
SWEDISH FLEET.


ENSIGN & JACK


ADMIRAL

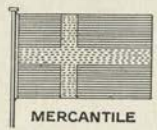

VICE ADMIRAL


REAR ADMIRAL


COMMODORE

SQUADRON COMMANDER

OFFICER COMMANDING DIVISION


MERCANTILE

Blue

Yellow

ROYAL STANDARD

MINISTER OF MARINE

Modern Swedish Guns (Bofors).

Notation.	Designation.		Length in calibres	Model.	Weight of Gun.	Weight of A.P. shot.	Initial velocity	Max. penetration firing A.P. capped at K.C. 8000 yds.	5000 yds.	3000 yds.	Danger Space against average warship, at 10,000 yards.	5000 yards.	*3000 yards.	Nom. Rounds per minute.
	c/m.	inches.			tons.	lbs.	ft. secs.	in.	in.	in.				
AAAAA	*28*	11	45	'11	41	760½	2576†	10½	15	18	...	...	...	1·2
AA	*25·4*	10	42	'94	29	450	2362	...	8	11	125	340	675	1
A	*21*	8·3	44	'98	17	275½	2460†	...	7	9½	100	425	600	·2
C	*15·2*	6	50	'03	7¼	100	2789†	...	...	7	75	230	460	6
E	*15.2*	6	45	'98	6	100	2460	...	...	6	60	200	410	6
	12	4·7	50	'11	3⅜	46½	2822	...	...	...	...	...	...	8
F	*12*	4·7	45	'94	3	46½	2430	...	...	3½	...	...	...	8

Guns marked † in the velocity column fire Bofors special nitro-compound.

Torpedo.

Whiteheads. *Submerged* tubes (Elswick pattern), except in *Oden & Svea* class. Torpedoes, 18 in., 15 in. and 14 in. Since 1911 torpedoes have all been manufactured at Karlskrona.

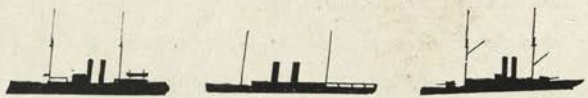
Wireless. Marconi.

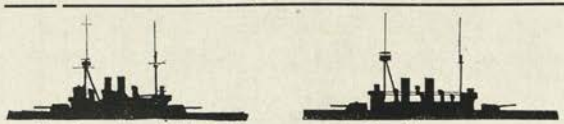
N.B.—Swedish photos all by favour of Kapten E. Hägg.

Revised by Kapten E. Hagg, Royal Swedish Navy.

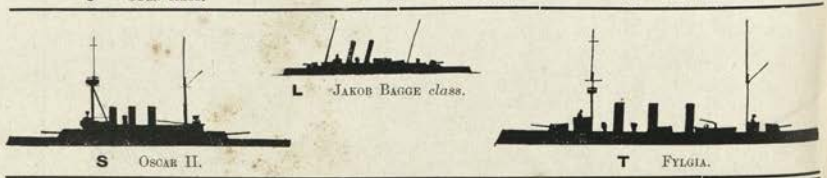
M cone.

O Bersерk *class.* P J. Ericsson *class.* O Edda Q Svensksund. E Skäggald *class.*

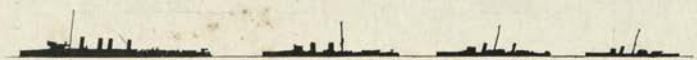

Verdande. S Drott. D H. Skagul.


F Åran *class* (4 ships). G Dristigheten.

J Oden *class.* H Svea *class.* N Psilander & Clas Uggla.


L Jakob Bagge *class.* S Oscar II. T Fylgia.

MT cone.


N Destroyers. O Plejad *class* t.b. P Blixt *class* t.b. Q Komet & Earlier t.b.

INSIGNIA OF RANK ON SLEEVES.

	Vice-Am.	Konter-Am.	Kommendör.	Kommendörkapten. 1 klass.	Kommendörkapten. 2 klass.	Kapten.	Löjtnant	Under-Löjtnant.
British / *U.S.A.*	*Rear-Ad.*	*Commodore.*		*Captain.*		*Commander & Senior Lieut.*	*Lieutenant.*	*Sub-Lieut.*

Note.—Full Admirals have 3 stars (as for Vice and Rear combined).

Reserve officers have *blue* above the stripes. All civilian officers have stripes without the curl, and colour between stripes as follows:—Constructors, *violet blue*; Doctors, *red*; Paymasters, *white*. Constructors also have rank designated by stars on collar lappel, which is black velvet.

Swedish Arsenals.

KARLSKRONA. One t.b. slip. Dry docks: (Oscar II.), $410 \times 69 \times 24\frac{3}{4}$; (No. 1), $203 \times 50 \times 19\frac{3}{4}$; (No. 2), $265 \times 50 \times 19\frac{3}{4}$; (No. 3), $209 \times 50 \times 19\frac{3}{4}$; (No. 4), $236 \times 50 \times 19\frac{3}{4}$; (No. 5), $212 \times 50 \times 19\frac{3}{4}$; (No. 6), $233 \times 50 \times 19$.

STOCKHOLM. One t.b. slip. One dry dock, $410 \times 58\frac{1}{2} \times 22\frac{3}{4}$ feet. There are also two private docks (Beckholmen), at Stockholm. (No. 1), $328 \times 55 \times 18$ feet; (No. 2), $321\frac{1}{2} \times 35\frac{1}{2} \times 11\frac{1}{2}$ feet.

Swedish Private Yards

(that build warships).

LINDHOLMEN (Lindholmens Mekaniska Verkstad och Varf) Gothenbourg. Two slips, 220 and 187 feet long. One dry dock, $402 \times 58\frac{1}{2} \times 20$ feet. One 60-ton crane. Electric and pneumatic plant. Total employees 900.

GÖTAVERKEN. Gothenbourg. Two slips (2500 and 1200 tons). No docks. Employees 700.

BERGSUND (Bergsunds Mekaniska Verkstad och Varf) Stockholm. One slip, 151 feet long. No docks. One 40-ton crane. Employees 600.

FINNBODA (same firm as above) Stockholm. One slip, 226 feet long. 60-ton crane. Employees: 700. One large floating dock, one small.

KOCKUM (Kockums Mekaniska Verkstads Aktiebolag) Malmö. One slip, 275 feet long. One dry dock, $236 \times 34 \times 12\frac{1}{2}$ feet. 45-ton crane. Electric, pneumatic, and hydraulic power throughout yard. Employees 1000. *One large dry dock building.*

Mercantile Marine.

About 1275 steamers (about 630,000 tons).
About 1600 sailing (about 160,000 tons).

Principal Trade Ports.

Göteborg, Stockholm, Malmö and Helsingborg.

Coinage.

1 krona = about 1s. $1\frac{1}{4}$d. British, 25 cents U.S.A. (18 kronor = £1).

General Notes.—Personnel: About 3500, also about 23,000 one-year conscripts are available. *Minister of Marine*: Ship-owner D. Broström. *Inspector of Marine*: Vice-Admiral W. Dyrssen. *Chief Constructor*: Vacant. *Colour of Ships*: Grey.

The new ship-building program has in view the formation of a sea-going squadron consisting of 8 ships of *Sverige* type, 16 destroyers (6 tubes each), and several submarines.

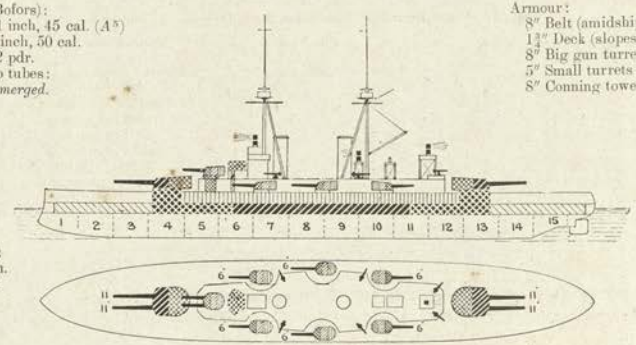
SVERIGE (*building*).

Displacement, 7000 tons. Complement, 408.

Length, $393\frac{3}{4}$ feet. Beam, 64 feet. Draught, $20\frac{1}{4}$ feet.

Guns (Bofors):
4—11 inch, 45 cal. (*A*^{5})
8—6 inch, 50 cal.
6—12 pdr.
Torpedo tubes:
2 *submerged*.

Armour:
8″ Belt (amidships) ... *aa*
$1\frac{3}{4}$″ Deck (slopes) .....
8″ Big gun turrets ...
5″ Small turrets .....
8″ Conning tower ...



Ahead:
4—11 in.
8—6 in.

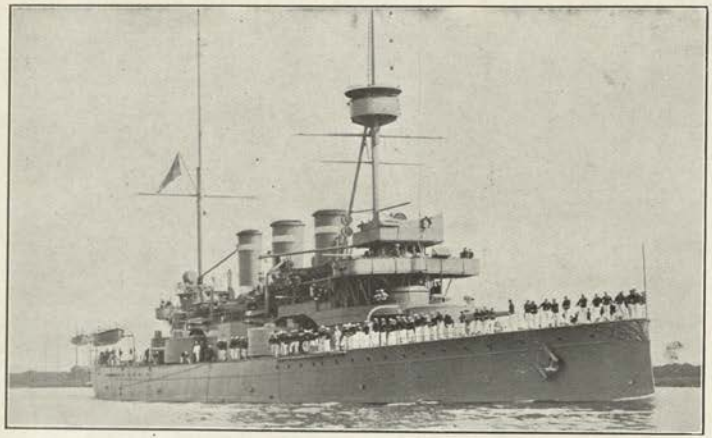
Astern:
4—11 in.
8—6 in.

Machinery: Boilers: Designed H.P. 20,000 = 22·5 kts.

Coal:

General Note.—This ship was sanctioned 1911; but upon a change of Government was cancelled by the Liberals. The nation then voluntarily subscribed a sum which at the end of April, 1912, amounted to nearly £970,000 for the building of this ship, which is estimated to cost £670,000; the balance to go towards a second ship.

Building at Götaverken, Gothenburg.

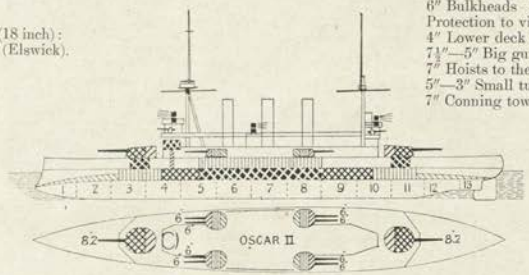


OSCAR II (1906).

Displacement, 4700 tons. Complement, 326.
Length, 313¾ feet. Beam, 49½ feet. *Maximum* draught, 16¾ feet.

Guns.
2—8·2 inch, 45 cal. (*A*).
8—6 inch, 50 cal.
10—6 pdr.
3—1 pdr.
Torpedo tubes (18 inch):
2 *submerged* (Elswick).

Armour (Krupp):
6″—4″ Belt (amidships) ..... *a-d*
2″ Deck (slopes) .....
6″ Bulkheads ..... *a*
Protection to vitals ..... *aa*
4″ Lower deck redoubt ..... *d*
7½″—5″ Big gun turrets (NC) *a-e*
7″ Hoists to these..... *a*
5″—3″ Small turrets (N.C.) .. *e-e*
7″ Conning tower..... *a*

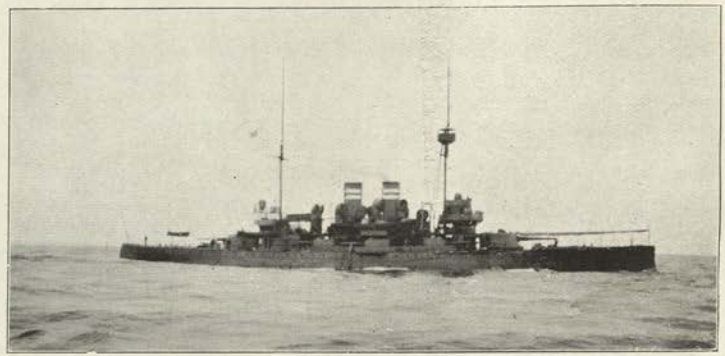


Ahead:
1—8·2 in.
4—6 in.

Astern:
1—8·2 in.
4—6 in.

Broadside: 2—8·2 in., 4—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 12 Yarrow. Designed H.P. 9000=18·3 kts.
Coal: *normal* 350 tons; *maximum* 500 tons.
Notes.—Four searchlights carried—one on each chart-house, two amidships. Built at Lindholmen. On *trial:* 9400=18·96 kts.



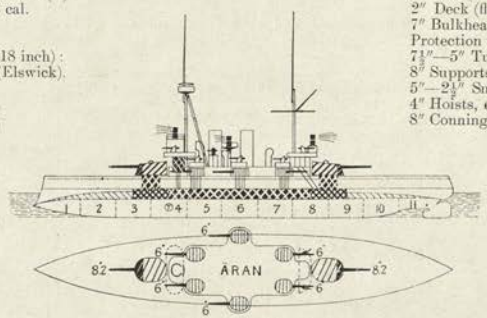
All alike. (ÄRAN Class—4 Ships.)

ÄRAN (1902), **VASA** (Dec., 1901), **TAPPERHETEN** (1902) & **MANLIGHETEN** (Dec., 1903).

Displacement, 3700 tons. Complement, 250.
Length, 287 feet. Beam, 49¼ feet. *Maximum* draught, 16 feet.

Guns:
2—8·2 inch, 45 cal. (*A*).
6—6 inch, 45 cal.
10—3 pdr.
2—1 pdr.
Torpedo tubes (18 inch):
2 *submerged* (Elswick).

Armour (Krupp):
7″ Belt (amidships) ..... *a*
2″ Deck (flat on belt)..... .....
7″ Bulkheads ..... *a*
Protection to vitals is ..... *a*
7½″—5″ Turrets ..... *a-e*
8″ Supports ..... *a*
5″—2½″ Small turrets (*N.C.*) *e-e*
4″ Hoists, etc. ..... *d*
8″ Conning tower ..... *a*

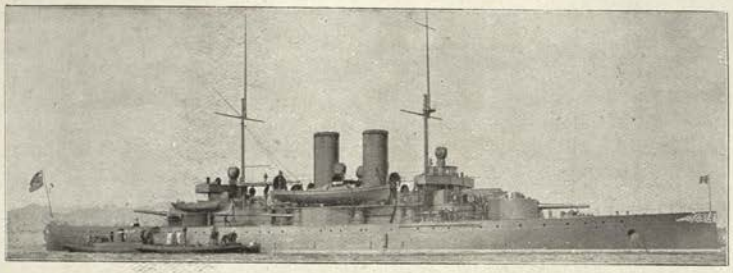


Ahead:
1—8·2 in.
4—6 in.

Astern:
1—8·2 in.
4—6 in.

Broadside: 1—8·2 in., 4—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 8 Yarrow. Designed H.P. 6500=17 kts.
Coal: *normal*, 325 tons; *maximum*, 360 tons. *Actual* radius: 2900 at 10 kts.
Notes.—Where built; *Aran*, Lindholmen; *Vasa*, Bergsund; *Tapperheten* and *Manligheten*, Kockum. These ships carry 4 searchlights.



Now rigged as plan.

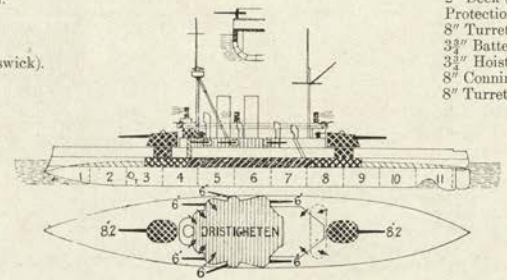
DRISTIGHETEN (1900).

Displacement, 3600 tons. Complement, 250.

Length, 285 feet. Beam, 48⅔ feet. *Maximum* draught, 16 feet.

Guns:
2—8·2 inch, 45 cal. (*A*).
6—6 inch, 45 cal.
10—6 pdr.
2—1 pdr.
Torpedo tubes:
2 *submerged* (Elswick).

Armour (Krupp):
8″ Belt (amidships) ..... *aa*
2″ Deck (flat on belt) .....
Protection to vitals ..... *a*
8″ Turrets..... *a*
3⅔″ Battery ..... *d*
3⅔″ Hoists..... *c*
8″ Conning tower ..... *a*
8″ Turret supports ..... *a*



Ahead:
1—8·2 in.
2—6 in.

Astern:
1—8·2 in.
2—6 in.

Broadside: 2—8·2 in. 3—6 in.

Machinery: 2 sets triple expansion. Designed H.P. 5570=16·8 kts. *natural* draught. 2 screws. Boilers: 8 Yarrow. Coal: *normal* 280 tons; *maximum* 400 tons=6 days full speed.

First trials: I.H.P. 5400=17 kts.

Built at Lindholmen. 4 searchlights. Fire control and tripod fore, fitted 1911-12.

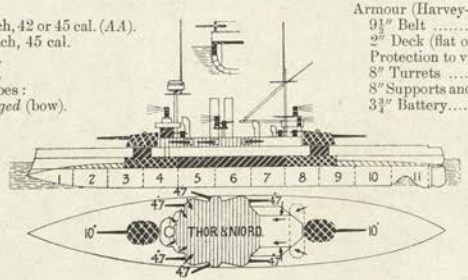
THOR (1898), & NIORD (1898).

Displacement, 3700 tons. Complement, 210.

Length, 279 feet. Beam, 49 feet. *Maximum* draught, 17 feet.

Guns:
2—10 inch, 42 or 45 cal. (*AA*).
6—4·7 inch, 45 cal.
10—6 pdr.
2—1 pdr.
Torpedo tubes:
1 *submerged* (bow).

Armour (Harvey-nickel):
9½″ Belt ..... *aa*
2″ Deck (flat on belt)
Protection to vitals is *aa*
8″ Turrets ..... *a*
8″ Supports and hoists *aa*
3¾″ Battery..... *d*



Ahead:
1—10 in.
2—4·7 in.

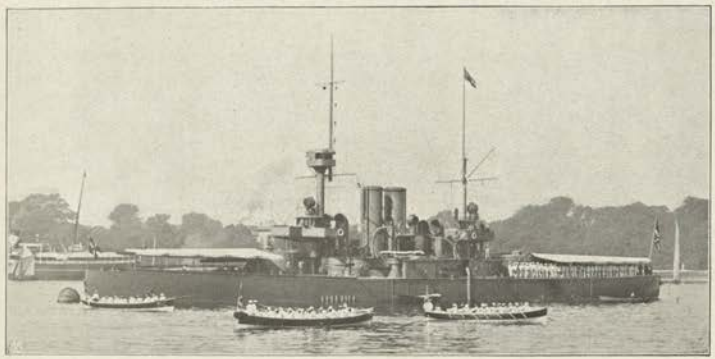
Astern:
1—10 in.
2—4·7 in.

Broadside: 2—10 in., 3—4·7 in.

Machinery: 2 screws. Boilers: 6 cylindrical. Designed H.P. 5300=16·5 kts. Coal: *normal*, 280 tons; *maximum*, 300 tons.

Notes.—The big guns of *Thor* are Canet, those of *Niord* are Bofors. 4 searchlights.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*First trials (f.d.):—*	*Boilers*	*Best recent speed*
Thor	Bergsund	By builders	1896	1899		=16·7	Cylindrical	16·5
Niord	Lindholmen		1896	1900		=16·5	Cylindrical	



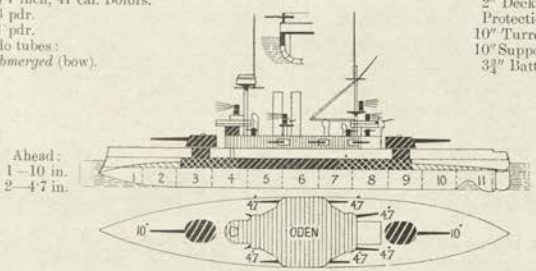
ODEN (March, 1896).

Normal displacement, 3700 tons. Complement, 210.

Length, 278½ feet. Beam, 48½ feet. *Maximum* draught, 17 feet.

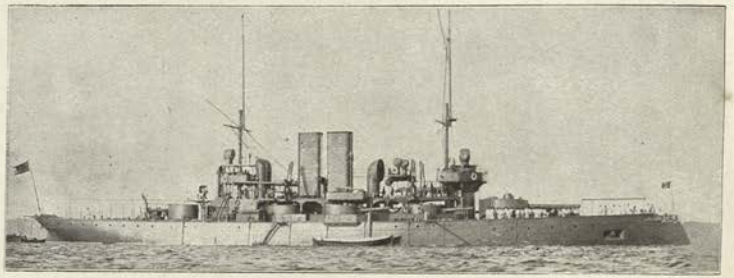
Guns (Canet and Bofors):
2—10 inch, 42 cal. (*AA*) Canet.
6—4·7 inch, 47 cal. Bofors.
10—3 pdr.
2—1 pdr.
Torpedo tubes:
1 *submerged* (bow).

Armour (Harvey-nickel):
10″ Belt (amidships)... *aa*
2″ Deck (flat on belt)
Protection to vitals is *aa*
10″ Turrets ..... *aa*
10″ Supports and hoists *aa*
3¾″ Battery..... *d*



Machinery: 2 screws. Boilers: 6 cylindrical. Designed H.P. 5300=16·5 kts. Coal: *normal* 275 tons; *maximum*, 300 tons. *Actual* radius: about 2400 at 10 kts.

Laid down at Bergsund, 1894. Completed 1898. 4 searchlights.



(Svea Class—3 Ships).

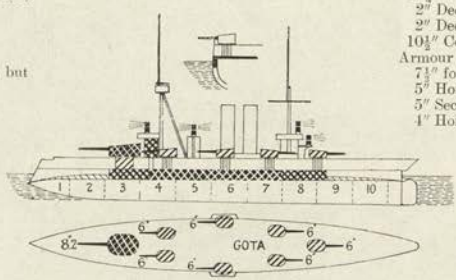
SVEA (1886), **GÖTA** (1889), & **THULE** (1893).

Displacement, about 3300 tons. Complement, 237.

Average length, 254 feet. Beam, 48 feet. *Maximum* draught, 17 feet.

Guns:
1—8·2 inch, 45 cal. (*A*).
7—6 inch, 45 cal.
11—6 pdr.
2—1 pdr.
Torpedo tubes:
1 *submerged* (bow), but *Thule* has none.

Armour (Creusot):
11¾″—8″ Belt ..... *a-b*
2″ Deck (flat on belt)..... *b*
2″ Deck (at ends) ..... =*c*
10½″ Conning tower ..... *b*
Armour (Krupp):
7½″ fore turret (N.C.) ... *a*
5″ Hoist to this (N.C.) . *c*
5″ Secondary turrets (7)... *c*
4″ Hoists to these ..... *d*



Ahead:
1—8·2 in.
4—6 in.

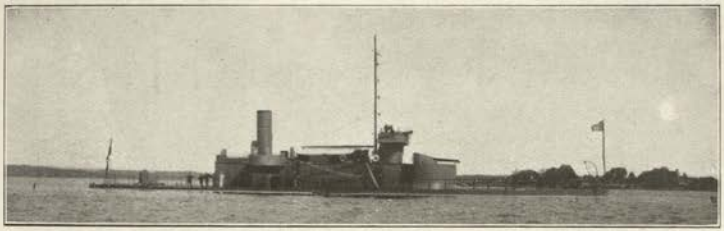
Astern:
5—6 in.

Broadside: 1—8·2 in., 4—6 in.

Machinery: 2 sets horizontal triple expansion. 2 screws. Boilers: 6 cylindrical. Designed I.H.P 4650=15 kts. Coal: *normal* 200 tons; *maximum* 300 tons.

Notes.—Completely reconstructed, 1900—04. *Göta* and *Svea* built at Lindholmen, *Thule* at Bergsund. *Svea* & *Göta* have square funnels, *Thule* round ones. 4 searchlights. Tripods fitted 1911-12.

SWEDISH MONITORS.

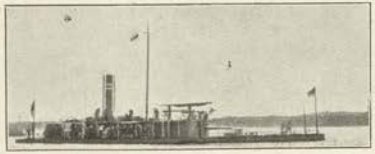


JOHN ERICSSON, THORDÖN, TIRFING (launched 1865—71, and reconstructed 1898—1903). 1500 tons. Complement 80.

Guns: *Ericsson.* 2—6 inch, 2—6 pdr., 2 machine, Armour (iron), 5″ belt, 10¾″ turret *(c)*
Thordön. 2—4·7 inch, 8—3 pdr., ,, 4½″ ,, 18″ ,, *(b)*
Tirfing. 2—4·7 inch, 8—6 pdr., ,, 4½″ ,, 10¾″ ,, *(c)*

All have a 9½″ conning tower. 1 screw. H.P. 380=8 kts. Coal: 150 tons.

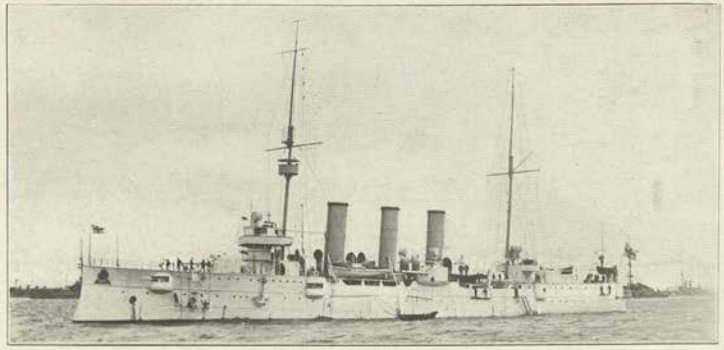
Thordön & *Tirfing* have 4·7 guns inside the turret.



BERSERK, BJÖRN, FOLKE, GERDA, HILDUR, SÖLVE & ULF (all built 1873—76, and reconstructed 1897—1909). 460 tons. Complement 48.

Guns: 1—4·7, 2—6 pdr., Armour (iron), 2½″ belt, 16½″ casemate *(b)* H.P. 155=7·6—8 kts. 2 screws. Coal: *maximum* 25 tons.

SWEDISH ARMOURED CRUISER (*Pansarkryssare.*) 22 kt.

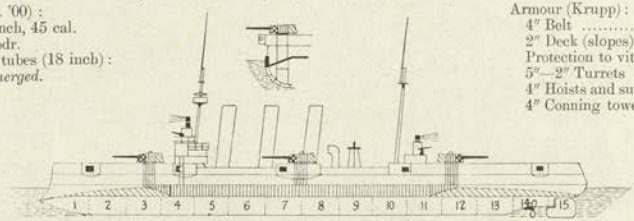


FYLGIA (1905).

Displacement, 4800 tons. Complement, 322.
Length, 379 feet. Beam, 49 feet. *Mean* draught, 16 feet.

Guns (M. '00):
8—6 inch, 45 cal.
14—6 pdr.
Torpedo tubes (18 inch):
2 *submerged.*

Armour (Krupp):
4″ Belt ..... *d*
2″ Deck (slopes) .....
Protection to vitals ... = *b*
5″—2″ Turrets ..... *b-e*
4″ Hoists and supports *d*
4″ Conning tower..... *d*

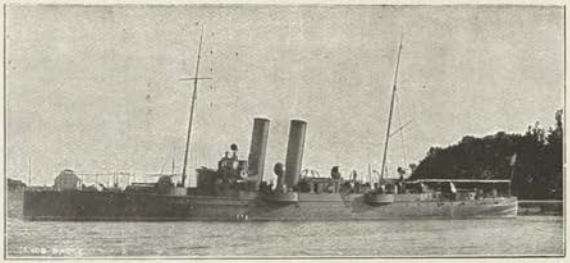


Ahead: 6—6 in.
Astern: 6—6 in.
Broadside: 6—6 in.

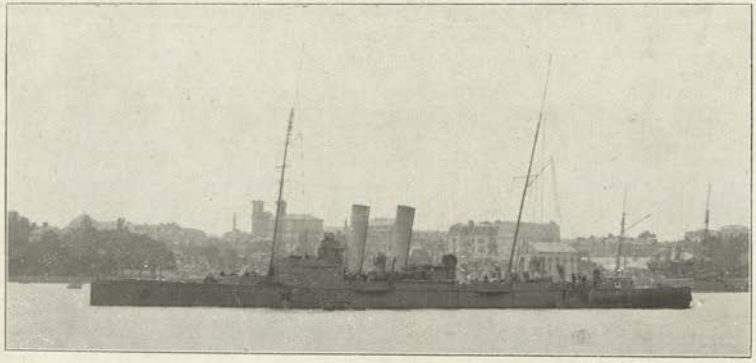
Machinery: 2 sets triple expansion. 2 screws. Boilers: 12 Yarrow. Designed H.P. 12,000=21·5 kts.
Coal: *normal* 350 tons; *maximum* 900 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*First Trials (mean)*	*Boilers*	*Best recent speed*
Fylgia	Finnboda	By builders	1903	1906		12,440=22·8	Yarrow	22·8

SWEDISH TORPEDO CRUISERS (*Torpedkryssare*).



JAKOB BAGGE (*Örnen* very similar).



CLAES HORN.

ÖRNEN (1896), **JAKOB BAGGE** (1898), **CLAES HORN** (1898) 850 tons.

Length, 223 feet. Beam, 27 feet. Draught, 10 feet.

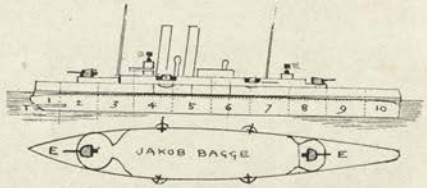
PSILANDER (1899), **CLAS UGGLA** (1898) 850 tons.

Length, 223 feet. Beam, 27½ feet. Draught, 9 feet.

Complement 99.

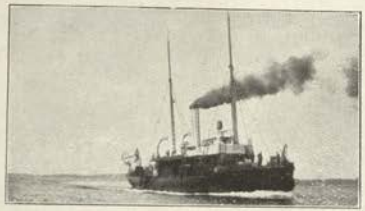
Guns:
2—4·7 inch, 45 cal.
4—6 pdr.
Torpedo tubes:
1 *submerged* (bow).

Armour (Bofors steel):
¾″ Deck .....
2″ Conning tower .....

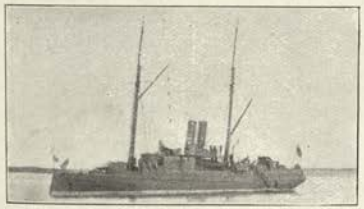


Machinery: 2 screws. Boilers: 2 Yarrow (except *Örnen*, which has 2 cylindrical). Designed H.P. 4000 = 20 kts. *natural draught.*

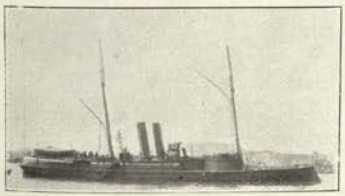
Gunboats (*Kanonbåtar*).



SVENSKSUND (1891). 400 tons. Guns: 2—6 pdr. Speed: 12¼ kts. Coal: 50 tons.



SKAGUL (1877) (1897). 600 tons. Guns: 1—6 inch, 1—4·7 inch, 2—6 pdr., 2 machine. Speed: 13 kts. Coal: 94 tons.



SKÄGGALD (1879) & **SKULD** (1880). 600 tons. Guns: 1—4·7 inch, 2 small. Speed: 13½ kts. Coal, 94 tons.

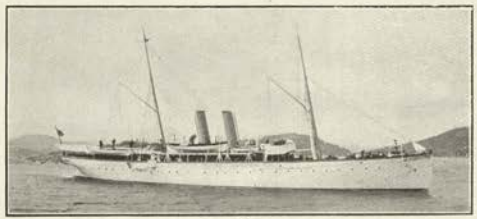
Skäggald converted into submarine depôt ship.

Gunboats—(*Continued*).

3 funnels.
No photo available.

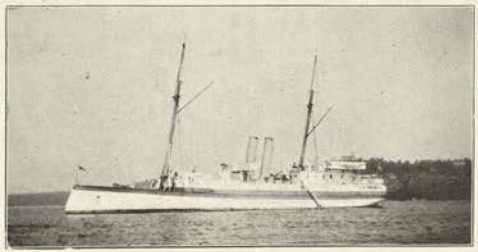
DISA (1877). 590 tons. Guns: 1—6 inch, 1—4·7 inch, 2—6 pdr., 2 machine. Speed: 11 kts. Coal: 130 tons.

Royal Yacht.



DROTT (1877). 620 tons. Guns: 4—3 pdr. Speed: 13 kts. Coal: 100 tons.

Hospital Ship (*Lasarettsfartyg*).

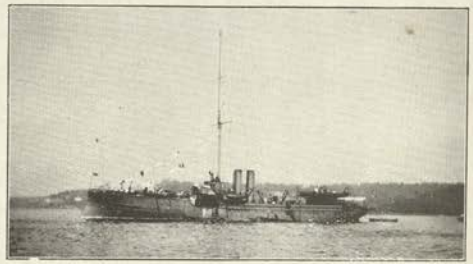


VERDANDE (1879). 536 tons. Speed: 13½ kts. Coal: 94 tons.

Mine Ships (*Minfartyg*).

No photo available.

CLAES FLEMING (1914). 1,500 tons. Guns: 4—4·7 inch (50 cal.), 6 machine. Speed: 20 kts.



EDDA (1885) (1907). 660 tons. Guns: 4—6 pdr. Speed: 13·5 kts. Coal: 80 tons.

No photo available.

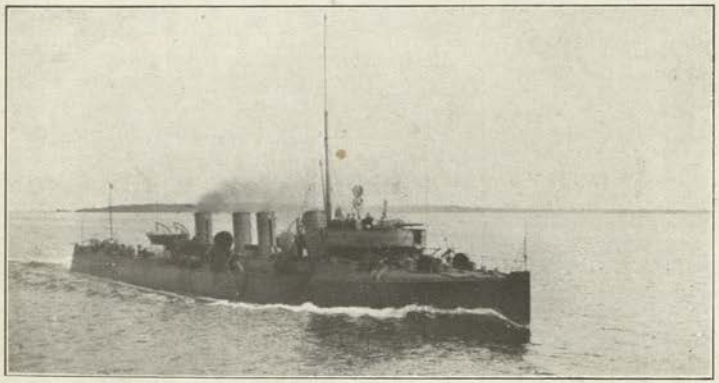
GUNHILD (1863). 240 tons. Guns: 2 machine. Speed: 8 kts. Coal: 32 tons.

There are 3 training ships for boys, *Najaden*, *Jarramas* and *Gladan*; a special balloon barge, 5 survey ships, 4 tugs, *Lägg Ut*, *Atle*, *Hjälparen*, and one more; and several guard boats, obsolete torpedo boats, etc.

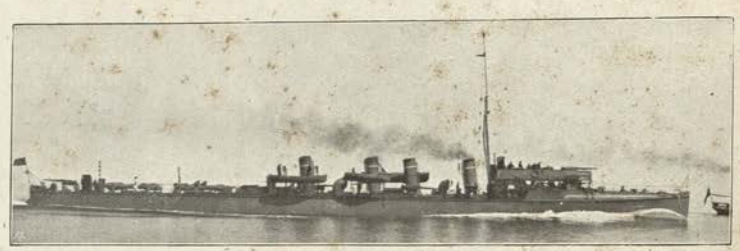
8 Destroyers.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			
6	*Wale*	'06–'10	460	8500	31	95	69	2	8½
1	*Magne* (T)	1905	460	7700	30·7	90	67	2	8½
1	*Mode* (Y)	1902	450	6500	31	90	67	2	9

T=Thornycroft. Y=Yarrow.



6 *Wale* class:—**Wale** ('06), **Ragnar** ('07) **Sigurd** ('07), **Vidar** ('09), **Hugin** ('11), **Munin** ('12). Armament: *Wale*, 2–12 pdr., 4–6 pdr.; other boats, 4–12 pdr.; 2–18 inch tubes. Yarrow boilers. Hull on Thornycroft lines. *Hugin* and *Munin* have Curtis turbines. All built in Sweden.



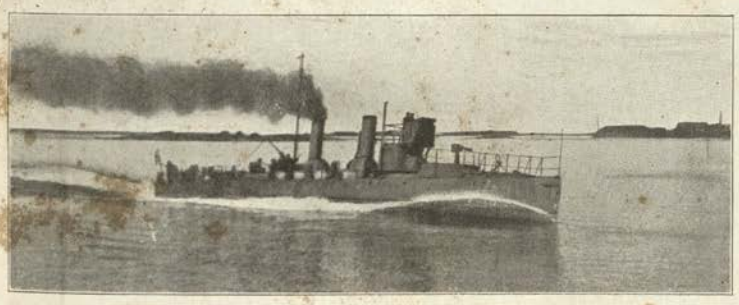
1 *Thornycroft*: **Magne** (1905), 460 tons. Speed: 30·7 kts. Coal: 90 tons. Armament: 6–6 pdr., 2 single 18 inch tubes aft. *Maximum* draught, 8½ feet.

1 *Yarrow*: **Mode** (1902), 450 tons. Speed: 31 kts. Coal: 90 tons. Armament: 6–6 pdr. Tubes: 2 single, aft, (18 inch). *Maximum* draught, 9 feet.

53 Torpedo Boats.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
	(First class)		tons		kts.	tons			feet
17	*Plejad* (N)	'05–'10	115-120	2000	26-28	18	18	2	8¼
12	*Blixt* (S)	'95–'04	100-115	1300	20-23	22 to 18	18	2	7¼
2	*Gondul*	1893	80	900	19.5	15	15	2	7
	(Second class)								
3	2–4	1886	80	620	18	15	15	2	7
1	No. 1 (T)	1884	70	620	18	11	15	2	7
10	5–15	'04–'08	59	800	21	22	14	2	6¼
4	85–79	'02–'03	49	700	20	18	14	2	6
4	77–71	'91–'92	40	450	19	7½	14	2	6

(N)=Normand type. (S)=Schichau type. (T)=Thornycroft.



Castor doing 28·3 kts.

17 *Plejad* class. ***Astrea*** ('07), ***Castor*** ('07), ***Iris, Plejad*** ('05), ***Pollux*** ('07), ***Thetis*** ('07), ***Spica*** ('07), ***Vega*** ('07) ***Vesta, Argo, Antares, Arcturus, Altair, Polaris, Perseus, Regulus, Rigel*** ('09-'10). Armament: (except for ***Plejad, Castor*** and ***Pollux,*** which have 2–3 pdr.), 2–6 pdr., 2–18 inch tubes. *Max.* radius 1200 miles. All except *Plejad* built in Sweden.

12 *Blixt* class (1904-1896). 100-115 tons. Speed: 23-20 kts. 2 tubes (15 inch), bow and aft. Guns: 2-3 pdr. Coal: 22-18 tons. *Maximum* draught, 7¼ feet.

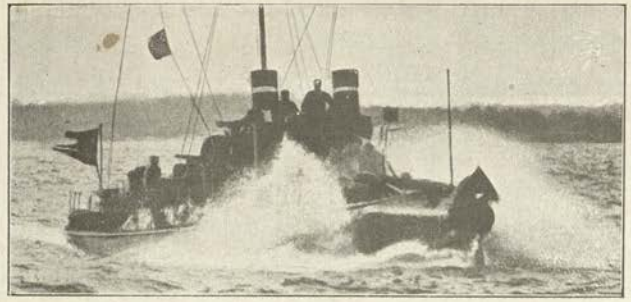
Named ***Blixt*** ('98), ***Bris*** ('00), ***Kapella*** ('04), ***Komet*** ('96), ***Meteor*** ('98), ***Mira*** ('02), ***Orion*** ('03), ***Orkan*** ('00), ***Stjerna*** ('98), ***Sirius*** ('03), ***Virgo*** ('02), ***Vind*** ('00). *Max.* radius: 900 miles.

All except *Komet* built in Sweden.

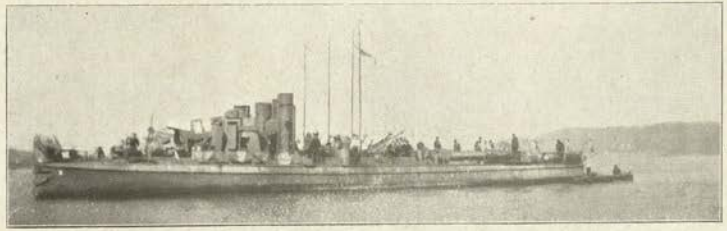
The earliest boat *Komet* has only 1 funnel.

One funnel.

2 *Gondul* class. ***Gondul*** ('93), ***Gudur*** ('93). Armament: 2 machine, 2—15 inch tubes. *Max.* radius: 650 miles.



4 Second class boats, ***1–4.*** Armament: 1 machine, 2–15 inch tubes. *Max.* radius: 625 miles.



10 second class boats, ***5–15*** (No. 13 vacant) } Armament: 1–3 pdr. 2–18 inch tubes. *Max.* radius: 700 miles.
4 boats ***79–85*** (alternate numbers) }

4 boats, ***77–71*** (alternate numbers). Armament: 1 machine, 2–14 inch tubes.

10 (?) Submarines.

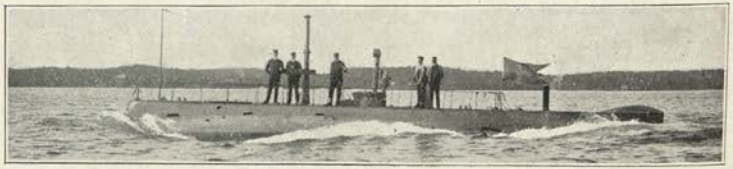
No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons			tons			feet
3	*New* (R)	1910	...	...	...	...	...	...	...
1	*Hvalen* (F)	1909	180 / 230	340 / 190	15 / 8	Petrol for 1000 miles	...	2	17
1	*Hajen* (R)	1904	107 / 127	200	9·5 / 7		6	1	9½

R = Richson. F = Fiat-San Giorgio.

Several new boats ready and building.

New *Richson* boats. These are improved *Hajens*.

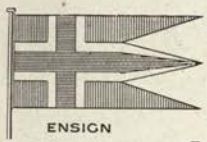
Hvalen (1909). Dimensions: 139×14×17 feet. 2–18 inch bow tubes.

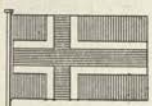


Hajen (1904). Dimensions: 71×12×9½ feet

NORWEGIAN FLEET.

Officially revised, by order of the Minister of Defence.





Red *Blue* *Yellow* *White*

Modern Guns (Elswick).

Notation.	Designation		Length in calibres	Model.	Weight of Gun.	Weight of A.P. shot.	Initial velocity	*Max.* penetration firing A.P. capped at K.C.		Danger Space against average warship, at			*Nom.* Rounds per minute.
								5000 yards.	3000 yards.	10,000 yards.	5000 yards.	3000 yards.	
	c/m.	inches.			tons.	lbs.	ft. secs.						
B	20·9	8·2	44	...	18½	309	2300	6½	9¼	100	405	594	...
E	15	6	46	...	7	100	2625	3	4½	67	215	440	8
F	12	4·7	44	...	2¾	44	2570	...	...	...	...	...	10
F	7·6	3	40	...	⅜	12	2210	...	...	...	...	...	..

Arsenal.

HORTEN. One dry dock, 346×60×20½ feet.

Principal Private Yards.

FREDRIKSSTAD: Fredriksstad Mek. Verksted. Docks: 1 small floating.
KRISTIANIA: (*a*) Nylands Verksted. Docks: 1 floating (320×61×19 feet), 2 smaller floating.
(*b*) Akers Mek. Verksted. Docks: 1 dry, 1 floating (both small).
SANDEFJORD: Framnas Mek. Verksted. Docks: 1 floating (360×61×19 feet), 2 smaller floating.
KRISTIANSAND: Kristiansands Tördoh. Docks: 1 dry, 330½×$\frac{36}{82}$×18 feet.
BERGEN: (*a*) Laxevaag Dockkonifragni. Docks: 1 dry, 365×68×18 feet.
(*b*) Bergens Mek. Verksted. Docks: 1 small dry.
(*c*) Bergens Dokkompagni. Docks: 1 small dry.
(*d*) Laxevaags Markin-og Jerushibsbyggen. Docks: *none*.
TRONDHJEM: Trondhjems Mek. Verksted. Docks: 2 small dry.
STAVANGER: Stavanger Stöjien og Dok. Docks: 2 small dry.

Mercantile Marine.

About 1900 steamers (170 over 1000 tons, 476 under 100 tons).
About 1170 sailing (328 over 1000 tons, 460 under 100 tons).

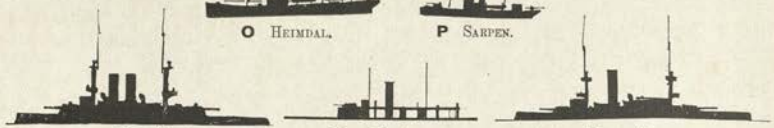
Principal Trade Ports.

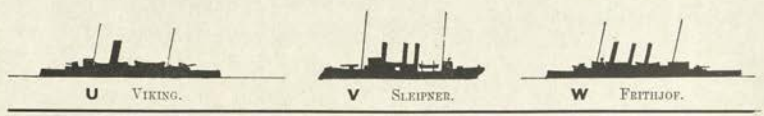
Kristiania, Bergen, Trondhjem.

Coinage.

Same as Swedish.

N cone.





TORPEDO CRAFT. **NT** cone.

INSIGNIA OF RANK ON SLEEVES.

	Admiral.	Vice-Am.	Kontre-Am.	Kommandör.	Kommandör-Kaptein.	Kaptein.	Premier-Löitnant.	Sekond-Löitnant.
British or U.S.A.	*Vice-Ad.*	*Rear-Ad.*	*Commodore.*	*Captain.*	*Commander.*	*Lieutenant.*	*Sub-Lieut.*	

In relative rank Engineers have the same *without curl*.
„ „ Doctors „ „ „ and a *red* passepoil above upper stripe.
„ „ Paymasters „ „ „ „ *blue* „ „ „

General Notes.—Personnel: About 1400 permanent, 1000 yearly conscripts, all seafaring men in reserve. *Minister for Defence* (February, 1913): General-Major Keilhau. *Chief of Staff*: Kommandör Berglund. *Commander-in-Chief*: Kontre-Adm. Dawes. *Colour of Ships*: French Grey.

NORWEGIAN COAST SERVICE BATTLESHIPS (*Panserskibi*).

BJOERGVIN (1914), & *NIDAROS* (1914).

Normal displacement, 4900 tons. Complement, 250.

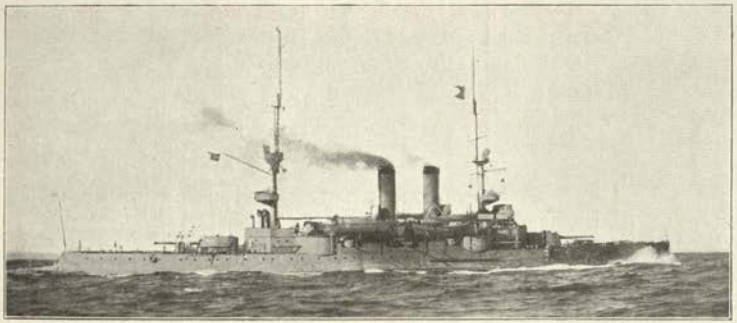
Length (*w.l.*), 312 feet. Beam, 55¾ feet. *Mean* draught, 16½ feet.

Guns (Elswick):
2—9·4 inch.
4—6 inch.
6—4 inch.
Torpedo tubes (18 inch):
2 *submerged* (broadside):

Armour (K.):
7″ Belt (amidships) ... *a*
8″ Turrets .....
6″ Secondary guns ...

Machinery: Designed H.P. 4500 = 15 kts. Coal: *normal* 175 tons. Boilers: Yarrow.
Both laid down at Elswick, January, 1913. To be completed 1914. Machinery by Hawthorn, Leslie & Co.

NORWEGIAN COAST SERVICE BATTLESHIPS *(Panserskibe).*



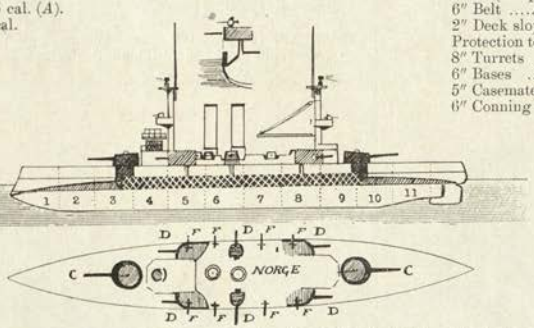
NORGE (1900), **EIDSVOLD** (1900).

Displacement, 4200 tons. Complement, 270.

Length, (*w.l.*) 303 feet. Beam, 50 feet. *Mean* draught, 16½ feet.

Guns (Elswick):
2—8·2 inch, 45 cal. (*A*).
6—6 inch, 45 cal.
8—12 pdr.
4—3 pdr.
Torpedo tubes:
2 *submerged*.

Armour (Krupp):
6″ Belt ..... *a*
2″ Deck slopes .....
Protection to vitals... = *aa*
8″ Turrets ..... = *aa*
6″ Bases ..... *b*
5″ Casemates (NC) ... *c*
6″ Conning tower.....



Ahead:
1—8 in.
2—6 in.

Astern:
1—8 in.
2—6 in.

Machinery: 2 screws. Boilers: 6 Yarrow. Designed H.P. 5200 = 17 kts. Coal: *normal* 440 tons; *maximum* 600 tons.

Notes.—Built at Elswick. Excellent seaboats.

TORDENSKJOLD. (Both exactly alike.)

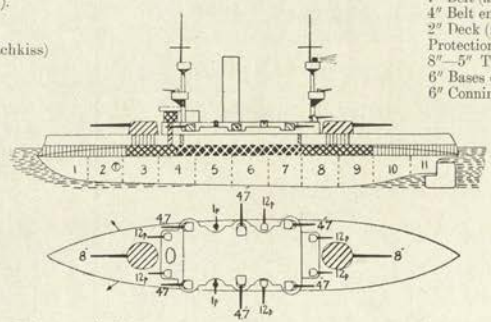
HARALD HAARFAGRE (1897), **TORDENSKJOLD** (1897).

Displacement, 3900 tons. Complement, 249.

Length, (*w.l.*) 297 feet. Beam, 48½ feet. *Maximum* draught, 18 feet.

Guns (Elswick):
2—8·2 inch (*A*).
6—4·7 inch
6—12 pdr.
2—1 pdr. (Hotchkiss)
Torpedo tubes:
2 *submerged*.

Armour (Harvey):
7″ Belt (amidships) ... *b*
4″ Belt ends ..... *d*
2″ Deck (flat on belt).
Protection to vitals is *b*
8″—5″ Turrets ... = *a*—*c*
6″ Bases of turrets ... *c*
6″ Conning tower..... *b*



Ahead:
1—8 in.
2—4·7 in.

Astern:
1—8 in.
2—4·7 in.

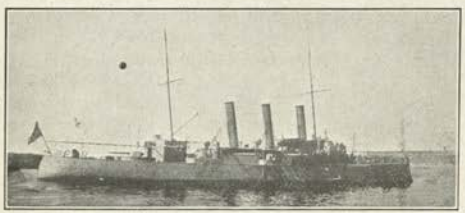
Machinery: Boilers: cylindrical. 2 screws. Designed H.P. 4500 = 17·2 kts. (*trial*, 1897). Coal: *normal* 400 tons; *maximum* 540 tons.

Notes.—Built at Elswick. Excellent seaboats.

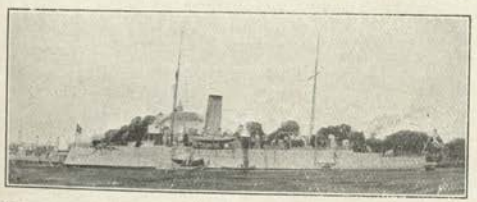
Monitors.

THOR, THRUDVANG, (Built 1869-72, and reconstructed 1895-97). 2000 to 1500 tons. Guns: 2—4·7, 40 cal., 2—9 pdr., 3 machine. Armour (iron): 7″ belt, 14″ barbette (*b*), 1″ deck. H.P. 500=8 to 8½ kts.

1st Class Gunboats.

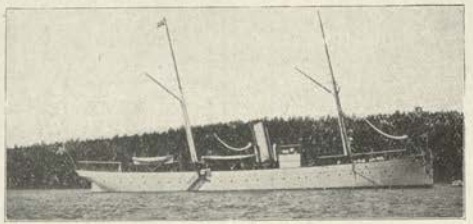


FRITHJOF (1895). 1480 tons. Complement, 166. Dimensions: 223×33×13¾ feet. Guns: 2—4·7 inch, 6—12 pdr., 4—3 pdr. Tube (18 inch), 1 *sub.* (bow). Designed H.P. 2800=15 kts. Coal: 160 tons.



VIKING (1891). 1200 tons. Complement, 153. Dimensions: 197×30½×12 feet. Armament: 1—4·7 inch forward, 1—6 inch aft, 4—12 pdr., 6—3 pdr. Torpedo tube (18 inch), 1 *sub.* (bow). Designed H.P. 2200=15·5 kts. Coal: 140 tons.

Special Service.



HEIMDAL (1892). 670 tons. Guns: 4—9 pdr. H.P. 625=12 kts. Coal: 92 tons. *Max.* draught: about 14 feet

2nd Class Gunboats.

AEGER (1892). 420 tons. Guns: 1—8·2 inch, 1—10 pdr., 2—6 pdr. H.P. 300=9 kts. Coal: 25 tons. *Max.* draught: 9 feet.

TYR (1888), & **GOR** (1885). 290 tons. Guns: 1—10·2 inch, 1—6 pdr. tube. H.P. 350=9·5 kts. Coal: 22 tons.

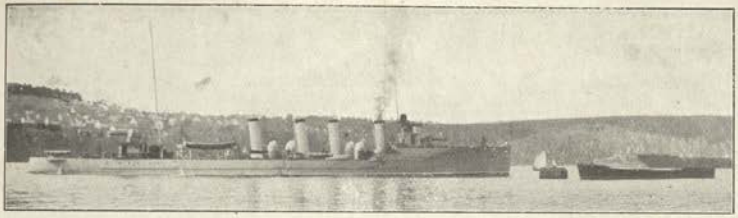
SLEIPNER (1877). 581 tons. Guns: 1—6 inch, 2—12 pdr., 2—9 pdr., 2—1 pdr. H.P. 450=12 kts. Coal: 81 tons. *Max.* draught: 11 feet.

SARPEN (1860). 190 tons. Guns: 2—9 pdr. H.P. 220=10 kts. Coal: 26 tons. *Max.* draught: 8 feet.

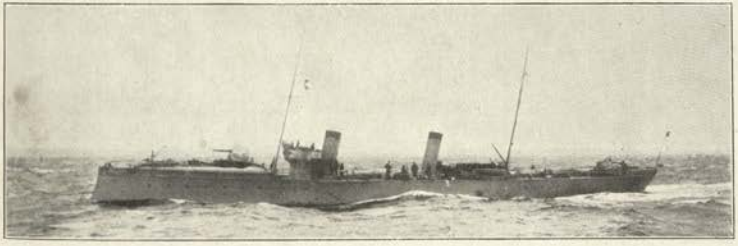
Appearance as Tyr and Gor.

BRAGE (1878), **NOR** (1878), **ULLER** (1874), **VALE** (1876) & **VIDAR** (1881). About 250 tons. Guns: 1—4·7 *or* 6 inch, 1—1 pdr. H.P. 220=8 kts. Coal: 22 tons.

4+3 NORWEGIAN DESTROYERS *(Jagare.)*

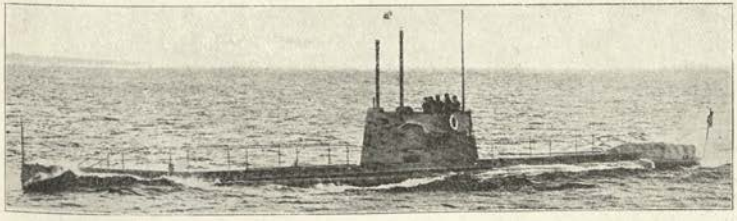


Draug (1908) and ***Troll*** (1910). 580 tons. Armament: 6—12 pdr., 3—18 in. tubes. H.P. 7800=27 kts. Reciprocating engines. Coal: 95 tons. Complement 71.
Garm and 2 others *building* this type, but with turbines.



1 *Schichau* type. ***Valkyrien*** (1896). 415 tons. Complement 59. Guns: 4—12 pdr., 2 torpedo tubes (18 in.) 2 screws. Boilers: Thornycroft. Designed H.P. 3300=23 kts. Coal: 90 tons.

1 Submarine *(Undervaudsboot.)*

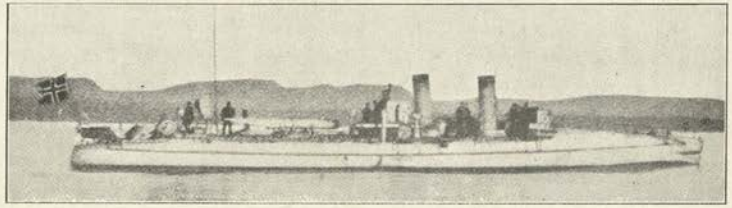


A 1 (1909) $\frac{200 \text{ tons.}}{250 \text{ tons.}}$ Speed: $\frac{12 \text{ kts.}}{8 \text{ kts.}}$ 3 tubes (18 in.) Complement 12. *Krupp Germania* type. Dimensions 128×12×9¼ feet.
4 more *Germania* boats *building*. (*A 2—A 5*).

31 TORPEDO BOATS *(Torpedo baater.)*

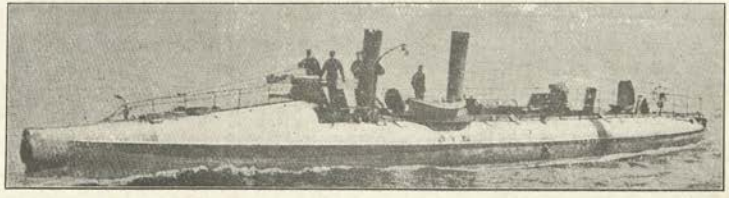
Single screw boats armed with a couple of 1 pdrs.

No.	Type	Date	Displacement	H.P.	Max. Speed	Coal	Complement	T. Tubes	Max. draug't
10	1st class— *Delfin*	'96—'01	tons 102	1100	kts. 21	tons 17	19	2	feet 7
3 5 2 8 4	2nd class— *Skarv* *Grib* *Hauk* *Hvas* *Vary*	'06—'12 '03—'05 1902 '96—'00 1894	103 73 75 75—65 65	1800 1050 750 650 650	25 23 20 19 19	16 15 12 12—14 12	18 14 14 14 12	3 2 2 2 2	7½ 6½ 6 6 6
1	*Mjg*	'99	27	290	17½	3	8	1	5



3 *Skarv* class. ***Skarv, Kjell, Teist.*** 5 *Grib* class. ***Grib, Jo, Lom, Örn, Ravn.***

10 *Delfin* class. ***Brand, Delfin, Hai, Hval, Laks, Sael, Storm, Sild, Skrei, Trods.***

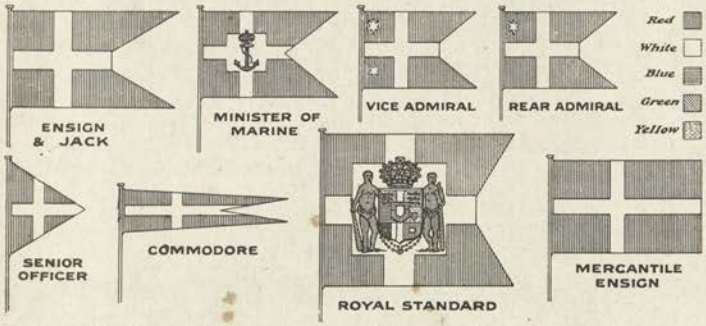


2 *Hauk* class ***Falk, Hauk.*** 2 *Vary* class. ***Raket, Varg.***
8 *Hvas* class ***Blink, Djerv, Dristig, Glimt, Hvas, Kjaek, Kvik, Lyn.***

DANISH FLEET.

D cone.

Officially revised.



Note.—Admiral has two stars in upper canton, one in lower; Division flag pennant, otherwise as commodore.

Personnel: About 4000, all ranks.

Arsenal.

COPENHAGEN. Dockyard. Dry docks (*a*) 288 × 59½ × 20½ feet;
(*b*) 106 × 27¾ × 8 feet (Floating, No. 1);
(*c*) 113 × 45 × 12 feet (Floating, No. 2);
(*d*) 412 × 23 × 20½ feet (Patent slip).

BC H Trolle *class* (3 ships).

CB Skjold.

DN Iver Hvitfeldt.

DF Valkyrien.

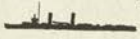
EH Hejmdal.

GI Gejser.

TORPEDO CRAFT. **DT** cone.

H Yarrow boats.

I Schichau boats.



J Modern t.b.

S Havhesten *class*.

Private Establishments.

COPENHAGEN. (BURMEISTER & WAIN). Two medium building slips. Dry dock 469 × 66 × 23 feet, and three patent slips. New dock 492 × 77 × 25 feet.
GAMLE. One slip. One dry dock 232 × 52 × 15¼ feet.
COPENHAGEN FLOATING DOCK CO. One floating dock 296 × 50 × 17 feet. There are also at Copenhagen two small patent slips.
ELSINOR. Dry docks (*a*) 379 × 57 × 18 feet (New Dock);
(*b*) 335 × 43 × 14 feet (Elsinor Dry dock);
Also a patent slip.
AARHUS. Patent slip, able to take a small torpedo boat.
Mercantile Marine: 558 steamers of 398,238 tons. 3,450 sailing, mostly fishing craft, etc. Sea trade chiefly with England, Sweden and Norway.
Oversea Possessions: Iceland, Greenland, Faroes Islands, Danish West Indies (St. Thomas, St. John, and St. Croix).
Coinage: Krone (100 ore) = about 1*s.* 1*d.* British; 50 cents U.S.A.
Minister of Marine: M. Krabbe.

HERLUF TROLLE.

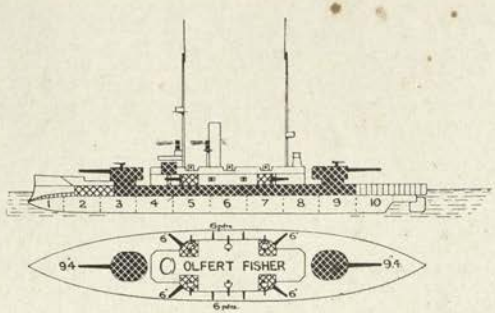
H. Trolle is to be distinguished from the others by having a very large steam pipe before the funnel.

(HERLUF TROLLE CLASS—3 SHIPS.)

The three differ in dimensions and armament as follows:—

	PEDER SKRAM.	OLFERT FISCHER.	HERLUF TROLLE.
Launched	May, 1908	1903	1899
Displacement (tons)...	3735	3650	3550
Complement	257	255	255
Length (ft.)	275⅜	272½	272½
Beam (ft.)	51⅝	50½	49½
Max. draught (ft.) ...	16	16¾	16½
Armament	2—9·4 inch, 45 cal. 4—6 in., 50 cal. 10—12 pdr. 2—1 pdr. 3 Machine 4 tubes	2—9·4 inch, 40 cal. 4—6 inch, 44 cal. 12—6 pdr. 2—1 pdr. 2 machine 3 tubes	2—9·4 inch, 40 cal. 4—6 inch 12—6 pdr. 2 machine 3 tubes
H.P.	5400	4600	4400
Speed	16	15·8	15·6

All are fitted with Thornycroft boilers and carry about 250 tons of coal.



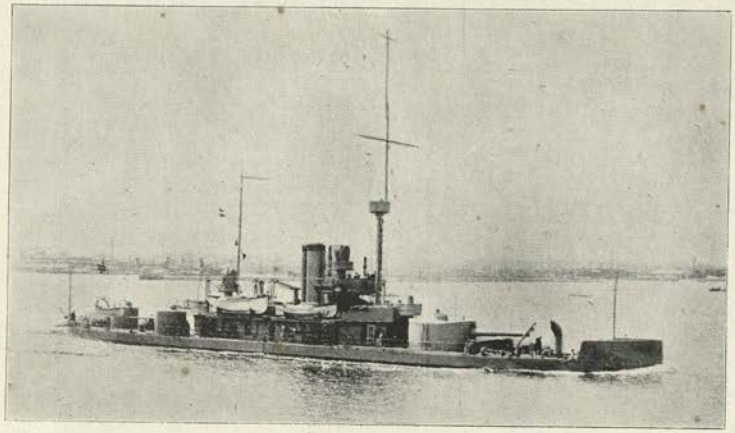
Armour (Krupp):

7″ Belt (amidships) ... *a*
4″ Belt (aft) ... ... *d*
3″ Deck (forward) ...
[Deck flat on belt.]
7″ Turrets ... ... *a*
6″ Casemates (KNC)... *b*
7″ Bulkhead ... ... *a*
7″ Conning tower ... *a*

New Programme.

New Ship, NIELS JUEL, laid down later in 1913. Sister to *Peder Skram.*

DANISH COAST SERVICE SHIP (*Kystforsvarsskib*).



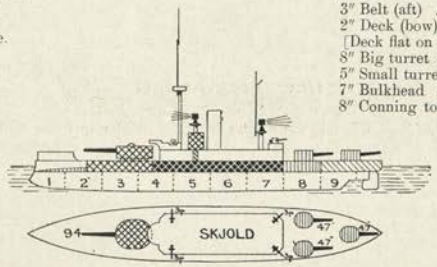
SKJOLD (1896).

Displacement, 2195 tons. Complement, 137.

Length, 227 feet. Beam, 38 feet. *Maximum* draught, 17½ feet. Length *over all*, 242¾ feet.

Guns:
1—9·4 in. (*A*).
3—4·7 in.
4—6 pdr.
2 Machine.

Armour (Harvey):
10″ Belt ... ... *a*
3″ Belt (aft) ... ... *c*
2″ Deck (bow) ... ... =*d*
[Deck flat on belt amidships.]
8″ Big turret ... ... *b*
5″ Small turrets ... ... *d*
7″ Bulkhead ... ... *b*
8″ Conning tower ... ... *b*

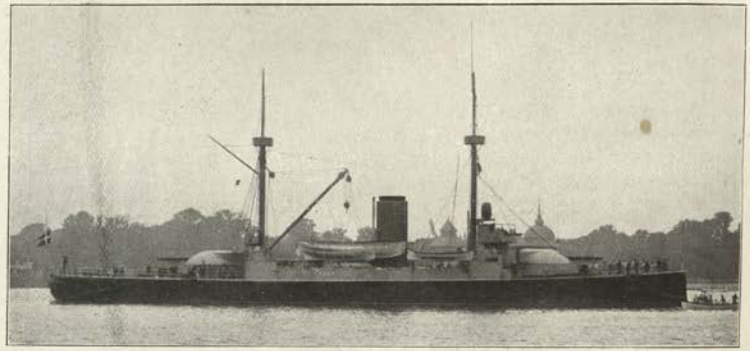


Ahead:
1—9·4 in.

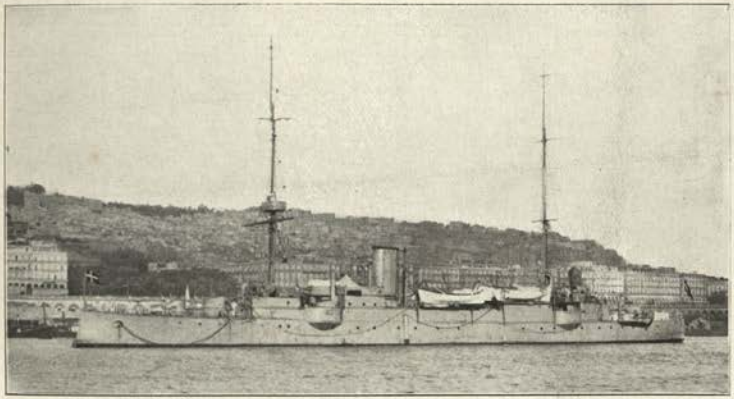
Astern:
3—4·7 in.

Machinery: I.H.P. 2400=13·4 kts. Boilers: Cylindrical. Coal capacity: 285 tons (*maximum*).
Freeboard, 3 feet. Width of belt, 6 feet.
Laid down 1893. Completed 1899.

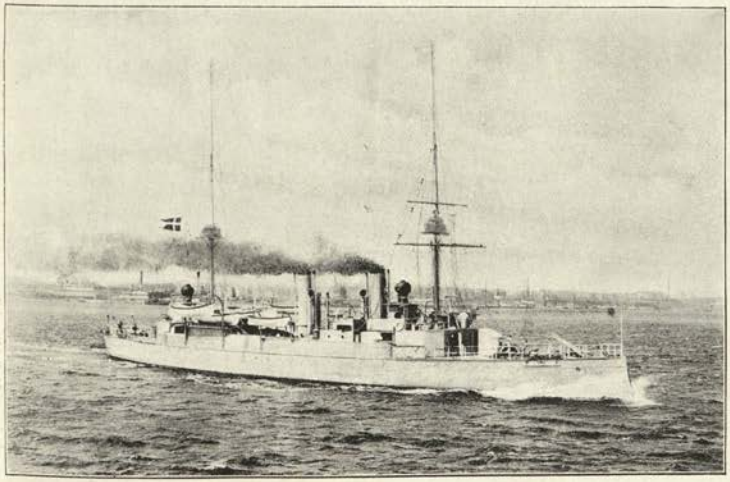
OLD DANISH BATTLESHIP (*Defensionsskib*).



IVER HVITFELDT (1886). 3446 tons. Complement 265. (Dimensions) L. B. D.: 242×49½×20 feet.
Guns: 2—old 10 in., 6—3 pdr., 10 machine, 2 tubes. Armour (compound): 11½″ Belt amidships, 8½″ Turrets. Designed H.P. 5000=15·5 kts.



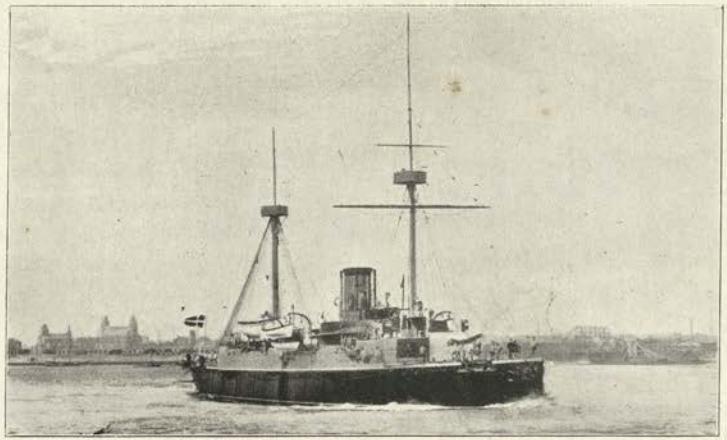
HEJMDAL.



GEJSER.

HEJMDAL (1894). 1313 tons. Complement, 156. Dimensions: 231¾×34×12 feet. Guns: 2—4·7 inch, 4—3·5 inch, 4—6 pdr., 3 machine, 4 torpedo tubes. 1¼″ deck amidships. 6″ engine hatches. H.P. 3100=17 kts. Thornycroft boilers. Coal: 125 tons.

GEJSER (1892). 1282 tons. Complement, 156. Dimensions: 231¾×34×11½ feet. Guns: 2—4·7 inch, 4—3·5 inch, 7 machine. 4 torpedo tubes. 1¼″ deck amidships. 6″ engine hatches. H.P. 3100=17·1 kts. Boilers, 8 Thornycroft (first ship to be so fitted).

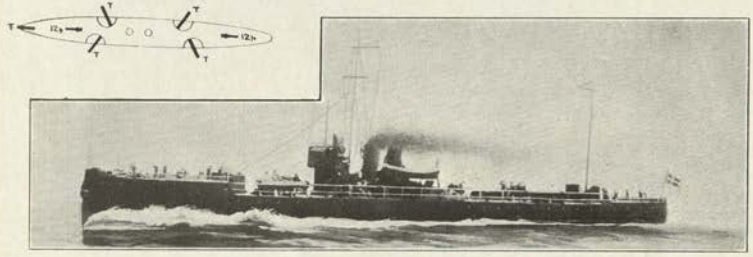


VALKYRIEN (1888). 3020 tons. Complement, 282. Length, 266¾ feet. Beam, 43½ feet. *Maximum* draught, 18½ feet. Guns: 2—8·2 inch, 18 cal., 6—6in., 32 cal., 6 machine, 5 *above water* tubes. 2½″ Deck. Designed H.P. 5300=17·4 kts. Coal: 496 tons.

17 + 3 Torpedo Boats.

No.	Class	Date.	Displacement	H.P.	*Max.* speed	Fuel	Complement	T tubes	*Max.* draug't
			tons		kts.	tons			feet
3	*Hvalrossen*	*building*	...	...	...	...	...	...	...
3	*Söridderen* (Y)	1911	240	5000	27·5	for 1400 at 14 k.	33	5	6¼
3	*Tumleren* (S)	1911	249	5000	27·5	" "	33	5	6¼
1	*Ormen*	1907	105	2100	26·2	14 tons coal	21	3	8¼
3	*Havörnen*	'98–'97	142	2100	23·5	...	24	4	7¼
2	*Makrelen*	1893	128	1400	20	...	20	4	...
1	*Springeren*	1891	89	810	18	...	17	2	7
2	*Havhesten*	1888	112	1200	21·2	...	20	4	7¼
2	*Storen*	1887	110	1300	22	...	20	4	7¼

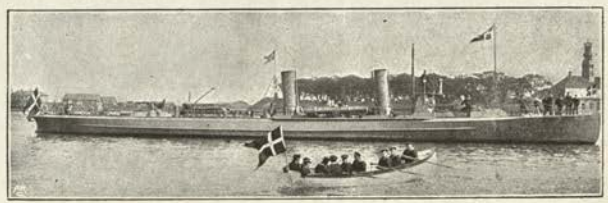
Also three very old boats No's 5—3, about 60 tons, formerly *Hvalrossen*, etc.
(S)=Schichau type. (Y)= Yarrow type.



3 *Yarrow* type: ***Söridderen, Söulven, Flyvefisken.*** Dimensions: 181¼ × 18 × 6¼ feet. Armament: 2–12 pdr., 5–18 inch tubes. There are 10 w.t. compartments. On trial did 5300 I.H.P.=28·2 *max.* Curtis turbines in *Söridderen*. First built by Yarrow, others by Burmeister & Wain. Yarrow boilers in all.

3 *Schichau* type: ***Tumleren, Vindhunden, Spækhuggeren.*** Armament: 2–12 pdr., 5–18 inch tubes. First by Schichau, others by Copenhagen Dockyard. Normand boilers in all.

1 *Ormen* class, named ***Ormen*** (1907). Armament: 2–1 pdr., 1–18 inch tube (bow, *submerged*), 2–18 inch (amidships).



3 *Havörnen* class, named ***Havörnen, Hajen, Söbjörnen.*** Armament: 1–3 pdr., 1–1 pdr. 4 tubes.
2 *Makrelen* class: ***Makrelen, Nordkaperen.*** Guns: 2 machine, 4 tubes.

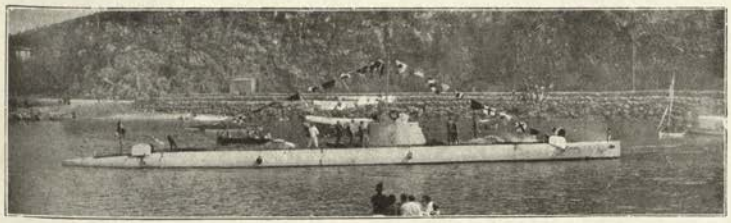
2 *Hvahesten* class: ***Havhesten, Narhvalen.*** Guns: 2 machine.

Stören class: ***Stören, Sölöven.*** Guns: 2 machine.

9 Submarines (*Undervandsbaade*).

8 *Whitehead* type: ***Havmanden*** (1911) (Fiume) & ***Havfruen*** (duplicate 1911), ***Thetis*** (1912), ***Najaden*** (1913), ***Nymfen*** (1913), ***2 April*** (1913), ***Neptune*** (1914), ***Galatea*** (1914). Built at Copenhagen. $\frac{162}{204}$ tons. H.P. $\frac{450}{275} = \frac{13}{10}$ kts. Diesel motors. 2 tubes. Dimensions: 129 × 12 × 8 feet.

(*Others pro.*)



One Fiat San Giorgio type, ***Dykkeren*** (1909) $\frac{105}{192}$ tons. Speed $\frac{12}{7\cdot5}$ kts. 3 screws. 2—tubes (2 torpedoes to each). Complement 9. Dimensions 114 × 11 × 7½. Radius about 100 miles. 210 h.p. petrol motor.

MISCELLANEOUS SHIPS.

2 Mine Ships (*Mineskibe*).

LOSSEN (1910). 628 tons. 3—12 pdrs. 13 kts.
HJÆLPEREN (1890). 288 tons. 3 machine guns. 11 kts.

Gunboats (*Kanonbaade*).

GULDORGSUND (1884). 268 tons. Guns: 2—3 pdr., 2 machine. H.P. 400 = 11·6 kts.
GRONSUND (1883). 247 tons. Guns: 2 machine. H.P. 400 = 11·6 kts.
LILLE BELT (1875). 247 tons. Guns: 7 machine. H.P. 200 = 7·6 kts.
FALSTER (1873). 390 tons. Guns: 7 machine. H.P. 510 = 9·8 kts.

Surveying Ships (*Opmaalingsskibe*).

MARSTRAND (1861). 172 tons. 11·4 kts. 2 guns.
KRIEGER (1861). 172 tons. 11 kts. 2 machine.
WILLEMOËS (1861). 162 tons. 11 kts. 2 guns.

Fishery Cruisers (*Inspektionsskibe*).

ISLANDS FALK (1906). 769 tons. 2—3 pdr. 13 kts.
BESKYTTEREN (1900). 447 tons. 2—3 pdr. 11 kts.
ABSALON. 297 tons. 2—3 pdr.

Torpedo Transports.

SLEJPNER (1882).

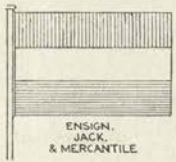
School Ship.

SKONNERT INGOLF (1876). 1012 tons. Guns: 4—6 pdr., 3 machine. Original speed: 10·5 kts.

Royal Yacht.

DANNEBROG (1879). 1104 tons. 13 kts.

DUTCH FLEET.



Dutch Uniforms.

	Admiraal	Lieut-Admiraal	Vice-Admiraal	Schout-by-nacht	Kapitein ter Zee	Kapitein Luitenant ter Zee	Luitenant ter Zee 1 Kl.	Luitenant ter Zee 2 Kl	Adelborst 1 Kl.
Corresponding British or U.S.	*Admiral of the Fleet*	*Admiral*	*Vice-Admiral*	*Rear-Admiral*	*Captain*	*Commander*	*Lieut. (over 11 years)*	*Lieut. (under 11 years)*	*Sub. Lieut.*

In relative ranks—
Doctors have insignia 4 to 8 without the curl.
Paymasters „ 5 to 9 „ in silver.
Engineers „ 5 to 8 with the curl with blue velvet between stripes.

The broad stripes in ranks 1—4 are 2 inches wide (5 c/m); 5—8, $\frac{3}{4}$ inch (1 c/m); No. 9, $\frac{1}{5}$ inch. Distance between stripes is $\frac{1}{5}$ inch (5 m/m).

Naval Guns (Krupp).

Notation	Calibre.		Long.	Weight of Gun.	Weight A. P. Shell.	Initial Velocity.	*Max* penetration with A. P. capped against K. C.		
							8000	5000	3000
	in.	c/m.	cals.	tons.	lbs.	ft. secs.	in.	in.	in.
AAA	11	28	40	31	760	2854	8	13	$15\frac{1}{2}$
D	11	28	35	27	474	2133	$2\frac{3}{4}$	4	$5\frac{1}{2}$
A	9·4	24	40	$25\frac{1}{2}$	474	2500	$3\frac{1}{2}$	$7\frac{1}{2}$	$10\frac{1}{2}$
AA	9·4	24	40	...	...	2624	4	$8\frac{1}{2}$	$10\frac{3}{4}$
E	8·2	21	35	16	$308\frac{1}{2}$	1740	—	—	$3\frac{1}{2}$
F	6·8	17	22	—	112	1558	—	—	—
E	6	15	40	5	100	2500	—	—	$3\frac{1}{2}$
F	6	15	35	$5\frac{1}{2}$	112	2000	—	—	—
F	4·7	12	40	$2\frac{3}{4}$	45	2150	—	—	—
F	4·7	12	35	2	57	1804	—	—	—
F	3	7·5	40	—	12·7	2379	—	—	—

Velocities of the 40-calibre guns are not service ones. Black powder for guns under 30 calibres. There are also a few old M. L. guns.

Arsenals.

HELDER AND WILLENSOORD. No slips. Dry docks:—
No. 1. $374\frac{1}{2} \times 63\frac{1}{2} \times 18$ ft.
No. 2. $273\frac{1}{2} \times 59\frac{1}{2} \times 16$
$428 \times 78 \times 20$ (Wilhelmina dock.)
ROTTERDAM. One slip. One dry dock—
$500 \times 78 \times 17\frac{1}{2}$ feet.
HELLEVOETSLUIS. One slip. Dry dock:—
$477 \times 54 \times 17\frac{1}{2}$ feet.

Private Establishments.

AMSTERDAM. Yard at which warships are constructed. Five floating docks here:—
(*a*) $410 \times 63\frac{1}{2} \times 17\frac{1}{2}$ (Koninginne)
(*b*) $410 \times 56 \times 18$ (Koning)
(*c*) $200 \times 62 \times 13\frac{1}{4}$ (No. 1)
(*d*) $160 \times 62 \times 13\frac{1}{4}$ (No. 2)
(*e*) $160 \times 62\frac{1}{2} \times 12\frac{1}{2}$ (No. 3)

ROTTERDAM. Yard at which warships are constructed. City floating docks as follows:—
(*a*) $360 \times 89 \times 23$ ft.
(*b*) $295 \times 57 \times 16$
(*c*) $157 \times 69 \times 15$
(*d*) $588 \times 85 \times 25$ (steel)
MIDDELBURG. The Prins Hendrik dock here is—$413 \times 65 \times 15$ feet.
FLUSHING. Yard at which warships have been constructed. One dry dock—$244 \times 52 \times 13$ ft.
DORDRECHT has a patent slip 180 feet long.

Docks in Java.

BATAVIA. Floating dock, $324 \times 67 \times 22$ feet (has taken *Gelderland* class).
SURABAYA. Floating dock, $330 \times 62 \times 24\frac{1}{2}$ feet;
„ „ $200 \times 57 \times 18$ feet.

Personnel: About 11,000 all ranks, navy and marine infantry (enlisted men).

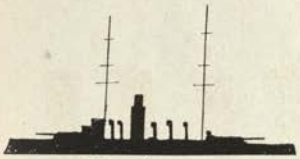
Mercantile Marine: 503 steamers of 564,903 tons net; 436 sailing of about 73,000 tons.

Principal Trade Ports: Rotterdam, Amsterdam, Flushing.

Coinage: Guilder (or florin) (100 cents) = 1*s.* 8*d.* British, or 40 cents U.S.A.

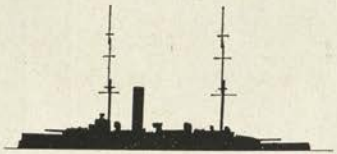
Oversea Possessions: Dutch East Indies (Sumatra, Java, Borneo, etc.); Dutch Guiana (Surinam); Curaçoa.

Minister of Marine: Vice-Admiral J. Wentholt (re-appointed, February, 1908).



AG Tromp.

AI Heemskerck.



AJ De Ruyter, H. Hendrik and K. Regentes.

BG Koetei *class.*

CA R. Claeszen.

DG Piet Hein *class.*

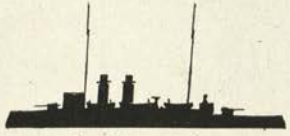
EM Surinam.
(Training Ship).

EN Zeehond.

EG Dolfijn.

FA Bellona.

AX Brinio *class.*



GI Holland *class.*
(after refit).

IJ Zeven Provincien.

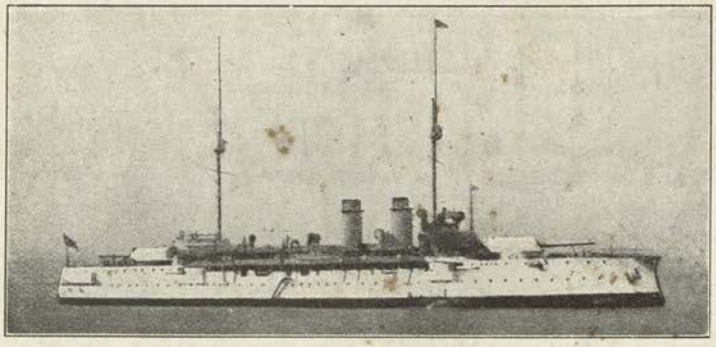
TORPEDO BOATS. **HT** cone.

K Sea-going boats. **L** Modern 1st class t.b. **M** Ardjoenoe, etc.

W Wolf *class* t.b.d.

New Programme.

One battleship, *pro.* Displacement, 7600 tons. Armament: 4—11 inch, 10—4 inch, 3—21 inch torpedo tubes. Armour: 6″ belt, 8″ turret. Machinery: 2 sets triple expansion. Yarrow boilers. Designed H.P. 10,000 = 18 kts.



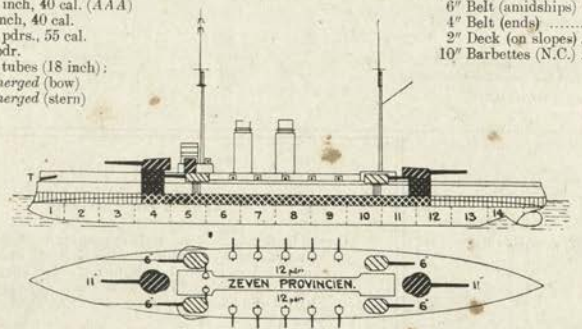
ZEVEN PROVINCIEN (1909).

Displacement, 6530 tons. Complement, 411.

Length, 333 feet. Beam, 56¼ feet. *Maximum* draught, 20 feet.

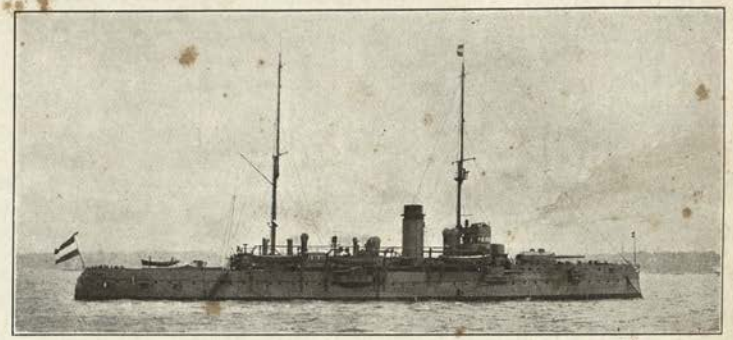
Guns (Krupp):
2—11 inch, 40 cal. (*AAA*)
4—6 inch, 40 cal.
10—12 pdrs., 55 cal.
4—1 pdr.
Torpedo tubes (18 inch):
1 *submerged* (bow)
1 *submerged* (stern)

Armour (Krupp):
6″ Belt (amidships) ..... *a*
4″ Belt (ends) ..... *d*
2″ Deck (on slopes) ..... *c*
10″ Barbettes (N.C.) ..... *aa*



Machinery: 2 sets triple expansion. 2 screws. Boilers: 8 Yarrow. Designed H.P. 7500= 16 kts. Coal: *normal*, 700 tons; *maximum*, 900 tons.

Notes.—Main belt is 7 feet wide. Laid down March, 1908.



HEEMSKERCK (September, 1906).

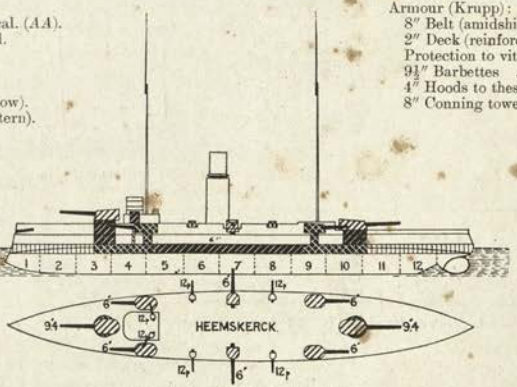
Photo by favour of Oscar Parkes, Esq.

Displacement, 5130 tons, Complement, —

Length (*waterline*), 315 feet. Beam, 52½ feet. *Mean* draught, 16½ feet. Length *over all*, 321½ feet.

Guns (Krupp):
2—9·4 in., 45 cal. (*AA*).
6—6 in., 40 cal.
6—12 pdrs.
4—1 pdr.
Torpedo tubes:
1 *submerged* (bow).
1 *submerged* (stern).

Armour (Krupp):
8″ Belt (amidships) .....=*aa*
2″ Deck (reinforcing belt)
Protection to vitals ...=*aaa*
9½″ Barbettes ..... *aa*
4″ Hoods to these ...=*c* & *d*
8″ Conning tower (N.C.)... *a*



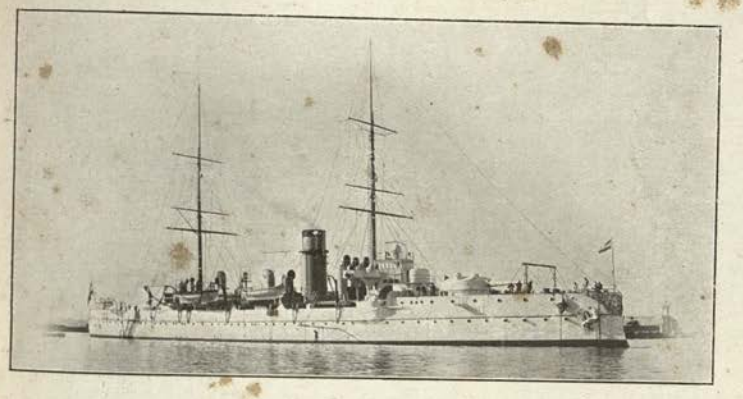
Ahead:
1—9·4 in.
2—6 in.

Astern:
1—9·4 in.
2—6 in.

Broadside: 2—9·4 in., 3—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 6 Yarrow. Designed H.P. 6000= 16 kts. Coal: *normal* 680 tons; *maximum* 825 tons.

Notes.—Main belt is 6 feet wide and about 220 feet long. Completed May, 1908. Built at Amsterdam. *Trials*: I.H.P. 6600=16·7 kts.



Photo, Geiser.

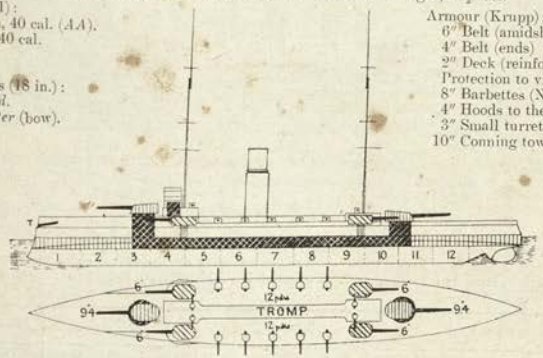
TROMP (1905).

Displacement, 5300 tons. Complement, 344.

Length, 331 feet. Beam, 48 feet. *Maximum* draught, 18½ feet.

Guns—(M. '01):
2—9·4 inch, 40 cal. (*AA*).
4—6 inch, 40 cal.
10—12 pdr.
4—1 pdr.
Torpedo tubes (18 in.):
2 *submerged*.
1 *above water* (bow).

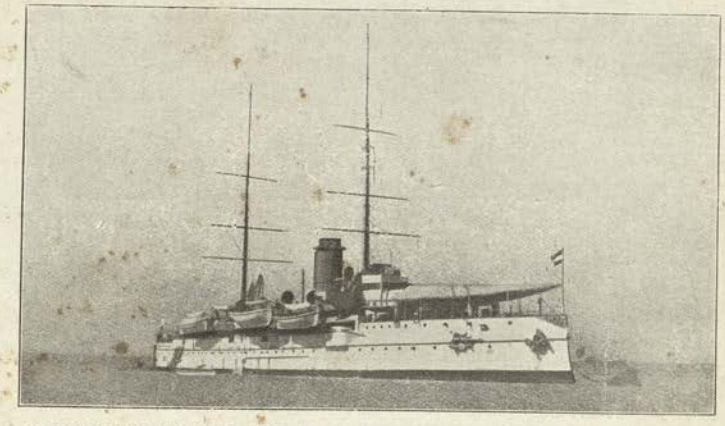
Armour (Krupp):
6″ Belt (amidships) ..... *a*
4″ Belt (ends) ..... *d*
2″ Deck (reinforcing belt)..... *aa*
Protection to vitals ..... *a*
8″ Barbettes (N.C.) ..... *d*
4″ Hoods to these ..... *d*
3″ Small turrets ..... *e*
10″ Conning tower ..... *aa*



Ahead:
1—9·4 in.
2—6 in.

Astern:
1—9·4 in.
2—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 6 Yarrow. Designed H.P. 6000= 16·5 kts. Coal: *normal* 680 tons; *maximum* 830 tons.
Trials ('06).—6,469 I.H.P. = 16·83 kts



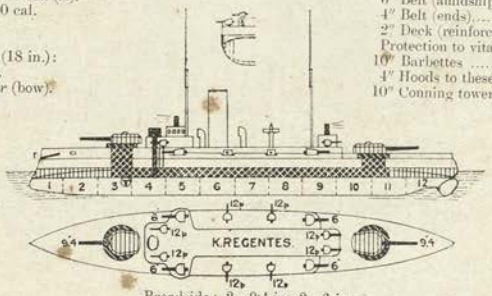
KONINGIN REGENTES (1900), **DE RUYTER** (1901), & **HERTOG HENDRIK** (1902).

Displacement, 4950 tons. Complement, 320.

Length, 312 feet. Beam, 48 feet. *Maximum* draught, 18 feet.

Guns—(M. '99):
2—9·4 inch, 40 cal. (*A*).
4—6 inch, 40 cal.
8—12 pdr.
2—1 pdr.
Torpedo tubes (18 in.):
2 *submerged*.
1 *above water* (bow).

Armour (Krupp):
6″ Belt (amidships) ..... *a*
4″ Belt (ends)..... *d*
2″ Deck (reinforcing belt)..... *aa*
Protection to vitals ..... *aa*
10″ Barbettes ..... *aa*
4″ Hoods to these ..... *d*
10″ Conning tower (fore) ..... *aa*



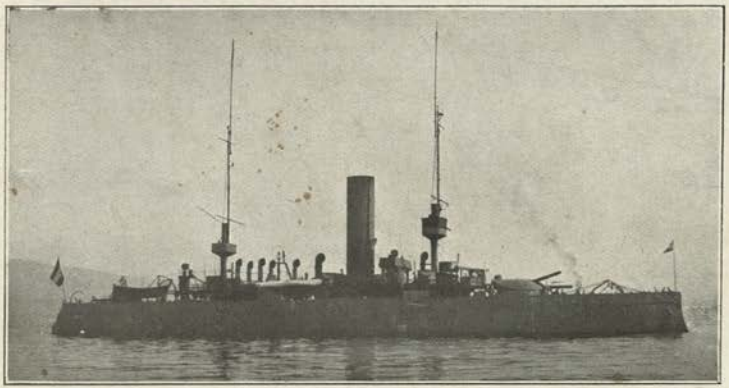
Ahead:
1—9·4 in.
2—6 in.

Astern:
1—9·4 in.
2—6 in.

Broadside: 2—9·4 in., 2—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: Yarrow. Designed H.P. 5300 = 16 kts.
Coal: *normal* 680 tons; *maximum* 840 tons.

Notes.—The belt is 5¾ feet wide, and 4 feet of it is below the waterline

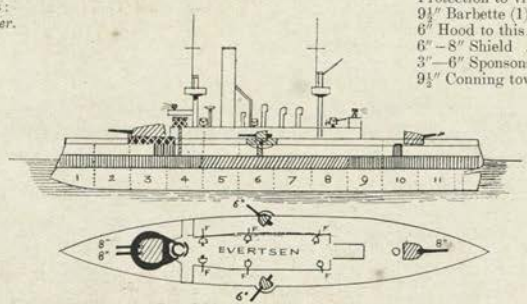


Photo, Spartali.

EVERTSEN (1894), **PIET HEIN** (1894), **KORTENAAR** (1894).
Displacement 3520 tons. Complement 260.
Length, 284 feet. Beam 47 feet. *Maximum* draught, 19 feet.

Guns:
3—8·2 inch, 35 cal. (*E*).
2—6 inch.
6—12 pdr.
6—1 pdr.
Torpedo tubes:
2 *above water*.

Armour (Harvey):
6″ Belt (amidships) ..... *e*
4″ Belt (ends) ..... *d*
2½″ Deck (flat on belt).....
Protection to vitals .....= *c*
9½″ Barbette (1) ..... *a*
6″ Hood to this..... *c*
6″—8″ Shield ..... *c*
3″—6″ Sponsons ..... *e*
9½″ Conning tower (fore) *a*

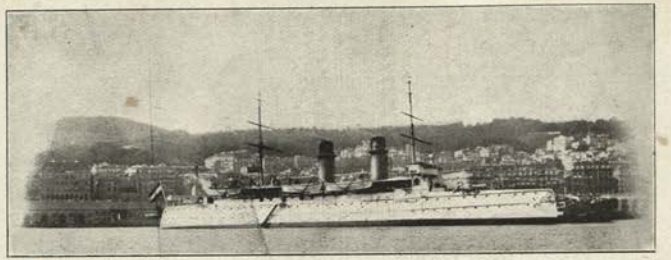


Ahead:
2—8·2 in.
2—6 in.

Astern:
1—8·2 in.
2—6 in.

Broadside: 3—8·2 in., 1—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: cylindrical. Designed I.H.P. *forced* 4800 = 16 kts. Coal: *normal*, 250 tons; *maximum*, 330 tons.
Notes.—The belt is 5¾ feet wide.

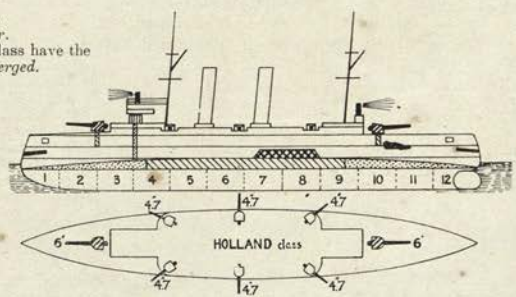


(Holland Class—6 Ships.)

GELDERLAND (1898), & **NOORDBRABANT** (1899).
Displacement 3950 tons. Complement 333.
Length, 311¾ feet. Beam, 48¾ feet. *Maximum* draught, 17¾ feet.
also
HOLLAND & **ZEELAND** (both 1896).
Displacement 3900 tons. Complement 333.
Length, 305 feet. Beam, 48¼ feet. *Maximum* draught, 17¾ feet.

Guns:
2—6 inch, 40 cal.
6—4·7 inch
4—12 pdr.
8—1 pdr.
4 Machine.
Torpedo tubes:
2 *above water*.
Gelderland class have the bow tube *submerged*.

Armour (steel and Harvey):
2″ Deck (steel) .....= *e*
4″ Engine hatches .....
6″ Gun shields .....
4″ Conning tower ..... *d*



Ahead:
1—6 in.
2—4·7 in.

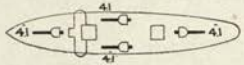
Astern:
1—6 in.
2—4·7 in.

Broadside: 2—6 in., 3—4·7 in.

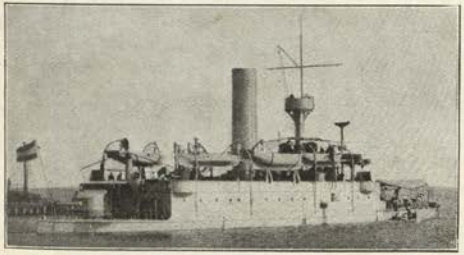
Machinery: 2 sets 3 cylinder triple expansion. 2 screws. Boilers: *Gelderland* class, Yarrow; *Holland* class, 8 Yarrow and 2 cylindrical. Designed H.P. 10,000 = 20 kts. Coal: *normal* 450 tons, *maximum* 970 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*First Trials; 4 hours, 1897-1900*		*Boilers*	*Best recent speed*
Holland	Amsterdam		'95	'98	11,712 = 20	10,548 = 19·6	Yarrow,	
Zeeland	Flushing		'95	'98	10,589 = 20	9818 = 19·4	2 cyl.	
Gelderland	Rotterdam		Feb.'95	'00	10,067 = 20·1	9867 = 20	Yarrow	
Noordbrabant	Flushing		Mar.'97		10,667 = 20	9323 = 19·8		

Coast Defence Monitors.



BRINIO, FRISCO, GRUNO (—— 1912). 540 tons. Dimensions: 170¾ × 28 × 9½ feet. Armament: 4—4·1 inch semi-automatic, 2 machine. Armour: 2″ Belt, ¾″ Deck, 2″ Conning tower. Machinery: 2 internal combustion motors. H.P. 1200=16 kts.

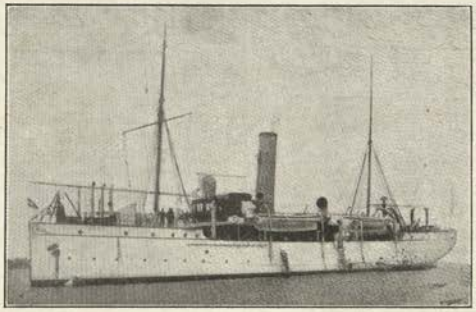


REINIER-CLAESZEN (1891). 2490 tons. Complement, 160. Dimensions: 229½ × 44½ × 14½ feet (*mean*). Armament: 1—old 8·2 inch, 35 cal.; 1—6·7 inch, 35 cal.; 4—6 pdr.; 3—1 pdr.; 2—14 inch tubes (*above water*). Armour (compound): 4¾″—4″ Belt, 3″ Deck, 11″ Bow turret, 11″ Conning tower. H.P. 2000=12·5 kts. Coal: *maximum* 160 tons.

Mine Ships.

HYDRA (1911) & **MEDUSA** (1911). 670 tons. Guns: 3—12 pdr. Speeds: 11·5 kts.

Gunboats.



ASSAHAN (1900), **KOETEI** (1898), **SIBOGA** (1898). 830 tons. Armament: 2—4·1 inch, 2—12 pdr. H.P. 1230=13 kts. Coal: 150 tons. Complement, 105. *Max.* draught, 15 feet.

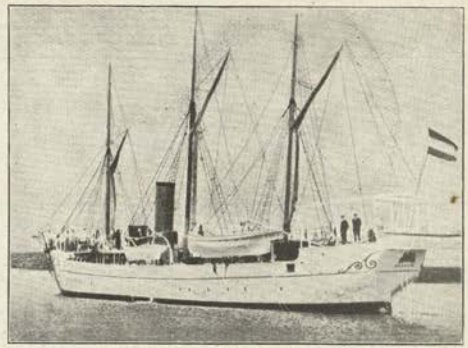
No photo procurable.

EDI (1896), **MATARAM** (1896). 810 tons. Armament: 3—4·7 inch. H.P. 1100=13 kts. Coal: 113 tons. Complement, 95. *Max. draught*, 14½ feet.

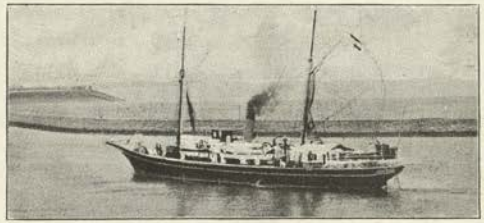
No photo procurable.

SERDANG (1896). 600 tons. Armament: 3—4·7 inch, 1—12 pdr. H.P. 850=12·5 kts. Coal: 60 tons. Complement, 95. *Max.* draught, 14 feet.

Fishery Cruisers.



ZEEHOND (1892). 710 tons. Armament: 6—4·1 inch.



DOLFIJN (1889). 250 tons. Armament: 2—12 pdr. *Maximum* speed: 12 kts.

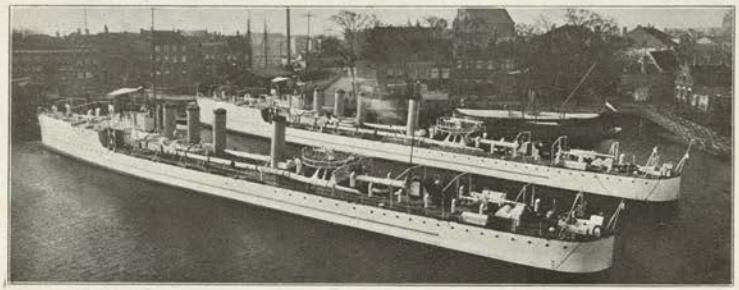
Gunnery Tender.

BELLONA (1892). Gunnery tender. 930 tons. Speed: 8 kts.

8 Destroyers (*Torpedo boatjagers*).

No.	Type	Date	Displacement	H.P.	*Max.* Speed	Coal	Complement	T. tubes	*Max.* Dra'ght
			tons			tons			feet
4	*Fret*	'10–'12	485	7500(t)	30	95	84	2	8
4		'09–'11							

Y = Yarrow type.

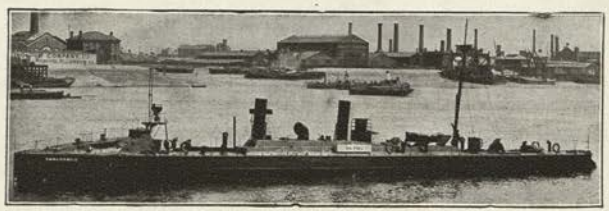


Fret class:—**Fret** (1910), **Wolf** (1910), **Jakhals** (1911), **Bulhond** (1911), **Hermyn** (1913), **Lynx** (1913), **Panter** (1913), **Vos** (1913). 485 tons. Armament: 4–12 pdr., 2 machine, 2–18 inch tubes. 4 Yarrow Boilers. (Yarrow design built at Ylissengen.) Dimensions: 231 × 21¼ × 9¼ feet.

47 + 8 Torpedo Boats (*Torpedobooten*). All of Yarrow type.

No.	Type	Date	Displacement	H.P.	*Max.* Speed	Coal	Complement	T. tubes	*Max.* Dra'ght
	Seagoing class—		tons			tons			feet
8	G 24–G 17	'13–'15	350						
4	G 16–G 13	'12–'13	180		25			3	
4		'07–'09							
4		'05–'08							
4	*Ophir* (G 12–G 1)	'04–'06	140	1900	25	30	26	3	7¼
3		'02–'04							
3		'00–'02							
	1st class—								
3	*Draak*	'05–'07							
3	*Sphinx*	'01–'04	103	1200	24	18	21	3	6
2	*Hydra*	'00–'01							
5	*Folca*	'88–'89	90	1000	22	15	16	3	7
3	*Ardjoeno*	'86–'88	83	800	21	10	16	3	7
	2nd class—								
3	*K 1–K 3*	'04–'06	43	450	18	5	12	3	6
3	*Noho*	'90–'91	50	790	20	7	16	2	6
3	*J. Hobein*	'90–'91	39	450	17	5	15	2	3

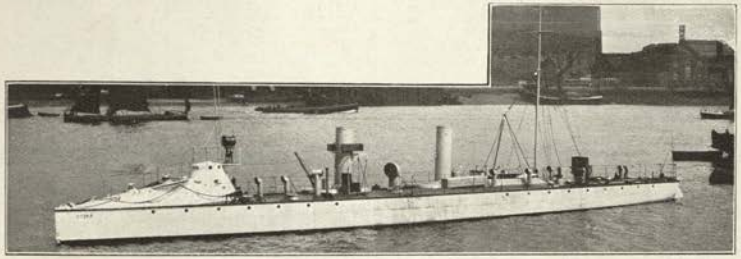
4 New 180 ton boats (1912-13). **G 16–G 13.** Armament: 2–12 pdr., 3–18 inch tubes. Raised forecastles.



4 ('07-'09 boats):—**G 9, 10** and **12,** and *with two masts,* **G 11.**
4 ('05-'08 boats):—**G 8–5.**
4 ('04-'06 boats):—**G 4–1.**
3 ('02-'04 boats) named:—**Tangka, Smeroe, Wajang.**
3 *Ophir* class, named:—**Ophir, Pangrango, Rindjani.**

} Armament: 2–3 pdr., 3–14 inch tubes.

DUTCH TORPEDO BOATS.



3 *Draak* class, named:—***Draak, Krokodil, Zeeslang.***
3 *Sphinx* class, named:—***Minotaurus, Python, Sphinx.***
2 *Hydra* class, named:—***Hydra, Scylla.***
} Armament: 2—1 pdr., 3—14 inch tubes.
(*Nominal* radius of all these class boats about 1500 at 10 kts.)

Note.—All these 8 belong exclusively to the Indian Marine.

5 *Foka* class: ***Empong, Foka, Goenteer, Habang, Idjen.***
5 *Ardjoeno* class: ***Ardjoeno, Cerberus, Cycloop.***
} Armament: 2—1 pdr., 3—14 inch tubes.

No photos available

These are just like *Draak* class but much smaller.

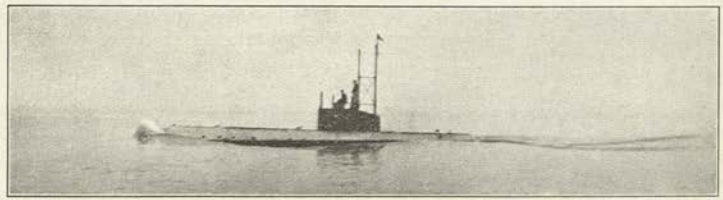
3 *Ex M. Gardijn* class: ***K 1–K 3.*** Armament: 2—1 pdr., 3—14 inch tubes.

3 *Nolo* class: ***Lamogan, Makjan, Nobo.***
3 *J. Hobein* class: ***Jacob Hobein, Jan Haringh, Jasper Lijnsen.***
} 2–1 pdr

6 + 4 Submarines (*Onder Zee Booten*).

No	Type	Date	Displacement tons.	H.P.	Max. speed kts.	Fuel	Complement	T. tubes	Max. draug't feet
4	*6 & 7*, K 2 & 3 (W)	1910-'11	380		16/11	For 2500 miles	...	..	..
3	*4 & 5* (W) & K.1	1911-'12	131	300	11/11	For 550 miles	..	2	...
2	*2 & 3* (W)	1910-'11	150	300	11/11				
1	*No. 1* (H)	1905	120	160	9/7	For 400 miles	9	1	...

H = Holland. W = Whitehead. K = Indian Marine.

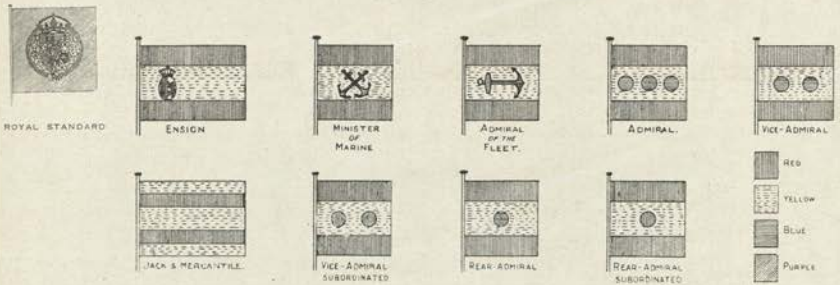


2–5. Dimensions: 105 × 9¼ × 9¼ feet. Armament: 2–18 inch tubes (a spare torpedo carried for each).
New boats same general type.

1.

SPANISH FLEET.

(Revised by Alferez de Navio Mateo Mille, R. Spanish Navy.)



Uniform Insignia.

Almirante General. *Admiral of the Fleet.*	Almirante. *Admiral.*	Vice-Almirante. *Vice-Admiral.*	Contra Almirante. *Rear-Admiral.*	Capitán de Navio. *Captain.*	Capitán de Fragata. *Commander.*	Capitán de Corbeta. *Lieutenant over 8 years.*	Teniente de Navio. *Lieutenant under 8 years.*	Alferez de Navio. *Sub-Lieutenant.*

Other branches, *without the curl*, have distinguishing colours as follows:—

Engineers	...	*green.*	Astronomical	...	*green brown.*
Constructors	...	*blue.*	Pharmacieus	...	*yellow.*
Doctors	...	*red.*	Chaplains	...	*violet.*
Paymasters	...	*white.*			

General.

Naval School is at Cadiz on land. At Ferrol, the old frigate *Villa de Bilbas* is a school for quartermasters, using the corvette, *Nautilus*. The old battleship *Numancia* is a school for the education of sons of quartermasters killed or disabled in war or on service. The battleship *Pelayo* is training ship for gunnery.

Minister of Marine: Vice-Admiral Pidal. *Chief of Staff*: Admiral Chacon.

Principal Naval Guns in Service.

Notation.	Nominal Calibre.		Model.	Length in calibres	Weight of Gun.	Weight of A.P. shell.	Initial velocity	Max. penetration A.P. capped direct impact at K.C. at		Danger Space against average ship, at			Rounds per minute.
								5000 yards.	3000 yards.	10,000 yards.	5000 yards.	3000 yards.	
	c/m.	inches.			tons.	lbs.	ft. secs.	inches.	inches.				
A^5	30·5	12	V'09	50	66	850	3010	17	20	...	...	..	2
AA	*32*	12·5	...	35	$47\frac{1}{2}$	1036	2034	8	11	...	...	...	...
B	*28*	11	...	35	$32\frac{1}{2}$	837	2034	$5\frac{1}{2}$	8	...	...	...	...
AA	*28*	10·8	...	40	30	507	2625	$8\frac{1}{2}$	$11\frac{3}{4}$	110	420	720	0·5
A	*24*	9·4	...	40	17	318	2625	$7\frac{1}{4}$	$9\frac{1}{2}$	110	350	620	1
D	*24*	9·4	..	35	21	439	2034	4	$6\frac{1}{4}$	60	250	500	0·5
F	*15*	5·9	...	45	$4\frac{1}{2}$	88	2625	...	3	25	200	430	5—6

Naval Yards, &c.

FERROL. Dry docks. (1) $590\frac{1}{2} \times 82 \times$ feet (completed 1913), (2) $457\frac{3}{4} \times 72\frac{1}{4} \times$ feet. Ferrol is the big shipyard. It has a large coal depôt, good bay, well fortified.

CARTAGENA. One dry dock, $541 \times 82 \times$ feet. One floating, 7000 tons. Cruisers, gunboats and torpedo craft building yard. Very strongly fortified.

LA CARRACA (Capiz). Dry docks. (1) $557\frac{3}{4} \times 91\frac{3}{4} \times$ feet, (2) $328 \times 72 \times$ feet, (3) $229\frac{3}{4} \times 59 \times$ feet, (4) $183\frac{3}{4} \times 46 \times$ feet. No slips. Only used as base for Morocco coast gun boats.

MAHON. Very small yard. One 6000 floating dock.

Private Docks.

At Barcelona (large floating), Bilbao, Cadiz, Gijon, Santander.

Mercantile Marine: 479 steamers, 420,579 tons net; 80 sailing, 23,143 tons net.

SPANISH IDENTIFICATION AND SIGNAL SILHOUETTES.

S cone. (1913 system).

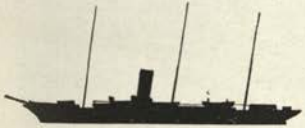
B Espana.

BG Nueva Espana *class.*

BJ Delfin *class.*

BH Bonifaz *class*

BI Numancia (gunnery school ship).



CN Giralda *(R. Yacht).*

DN Inf. Isabel.

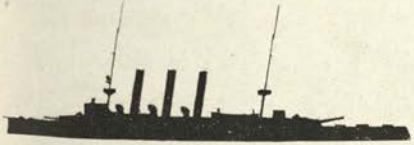
GH Estramadura.

GI Rio de la Plata.

GJ D. Maria de Molina *class.*

KG Pelayo.

LG Cataluna *class.*



NG Carlos V.

TORPEDO CRAFT. **ST** cone.

K Acevedo *class* t.b. **L** Habana t.b. **M** Azor t.b.

N New t.b.

P Bustamente *class* t.b.d.

Q Old destroyers.

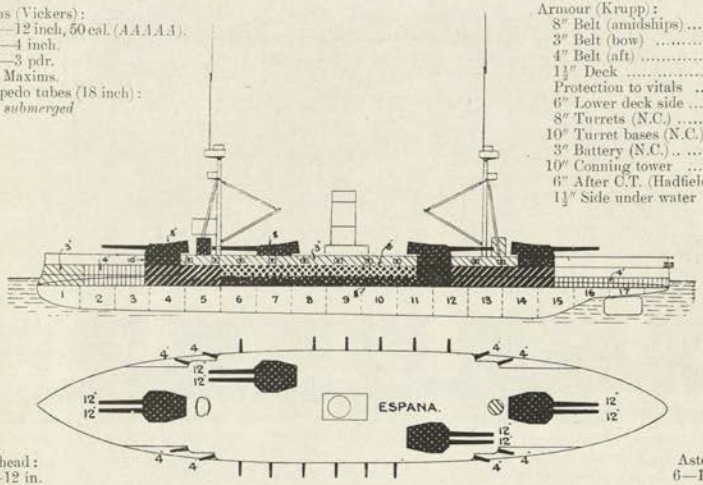
ESPANA (Feb., 1912), **ALFONSO XIII** (1913), & *JAIME I* (1914).

Normal displacement, 15,700 tons.

Length (*waterline*), 439½ feet. Beam, 78¾ feet. *Mean* draught, 26 feet.

Guns (Vickers):
8—12 inch, 50 cal. (*AAAAA*).
20—4 inch.
2—3 pdr.
2 Maxims.
Torpedo tubes (18 inch):
3 *submerged*

Armour (Krupp):
8″ Belt (amidships) ..... *aa*
3″ Belt (bow) ..... *e*
4″ Belt (aft) ..... *d*
1½″ Deck ....
Protection to vitals ...=*aaa*
6″ Lower deck side ..... *a*
8″ Turrets (N.C.) .....=*aa*
10″ Turret bases (N.C.) ...*aa*
3″ Battery (N.C.) ..... *e*
10″ Conning tower .....*aa*
6″ After C.T. (Hadfield) ... *b*
1½″ Side under water ... .



Ahead:
6—12 in.

Astern:
6—12 in.

Broadside: 8—12 in.

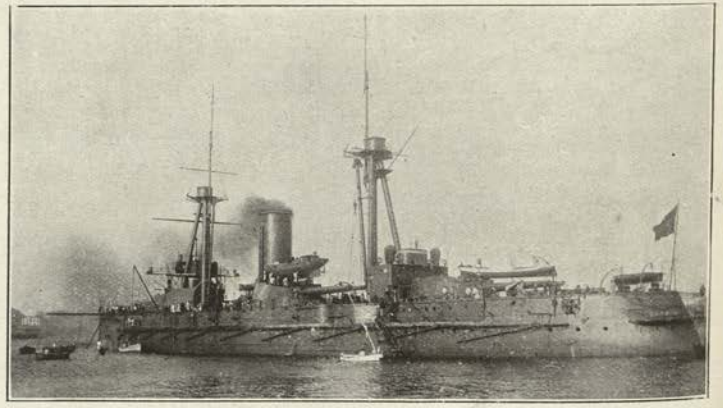
Machinery: Parsons turbine. 4 screws. Boilers: Yarrow. Designed H.P. 15,500=19·5 kts. Coal: *normal* 900 tons; *maximum* 1900 tons = nominal radius of 5000 miles at 10 kts.

Torpedo Notes.—Bullivant net defence.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Espana	Ferrol	Vickers, etc.	Dec. '09	1913	22,260=20·52	Yarrow	
Alfonso XIII			Feb. '10	July, '14	=		
Jaime I			1912	1915	=	in all.	

General Note.—Built in Spain by a British Syndicate, Vickers & Elswick, with Spanish workmen.

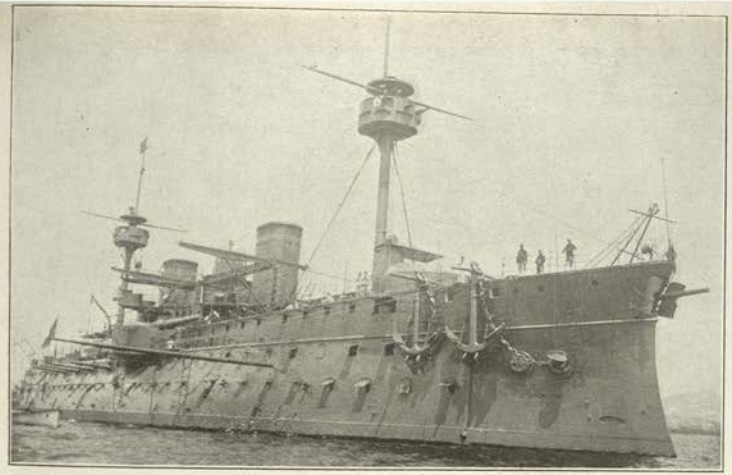
ESPANA. *Photo by favour of Lieut. Tennison, R.N.*



ESPANA. *Photo (1914), Alferez de Navio, M. Mille.*

New Programme.

Victoria Eugenia, *B* and *C* to be laid down 1914—'15. Armament: 8—15 inch, 20—6 inch. To be completed 1920.

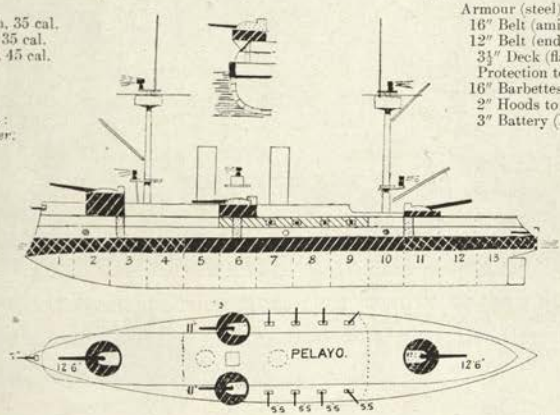


PELAYO (1887) (1897).

Displacement, 9950 tons. Complement, 621.
Length, 330 feet. Beam, 66 feet. *Maximum* draught, 28½ feet.

Guns:
2—12·6 inch, 35 cal.
2—11 inch, 35 cal.
9—5·5 inch, 45 cal.
12—6 pdr.
9—1 pdr.
2 machine.
Torpedo tubes:
7 *above water*.

Armour (steel):
16″ Belt (amidships) .....*aa*
12″ Belt (ends) ..... *a*
3½″ Deck (flat below belt).
Protection to vitals ... =*aaaa*
16″ Barbettes .....*aa*
2″ Hoods to these..... *f*
3″ Battery (Harvey)..... *e*



Machinery: 2 sets vertical compound. 2 screws. Boilers: 16 Niclausse (in 4 groups). Designed H.P. 7996=16 kts. Coal: *normal* 500 tons; *maximum* 667 tons. On *trial* (1898) she made for 10 hours, I.H.P. 8000=16·1 kts.

Note.—Built at La Seyne. Reconstructed there in 1897.

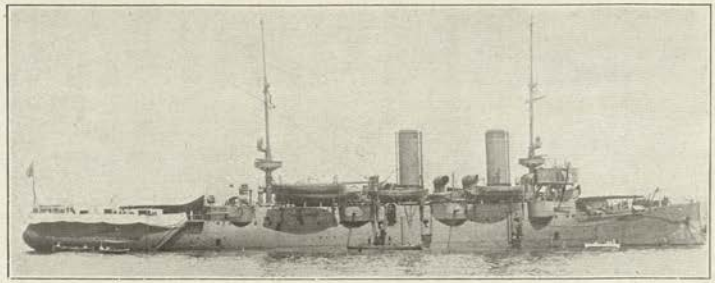


Photo (1914), Alferez de Navio, M Mille.

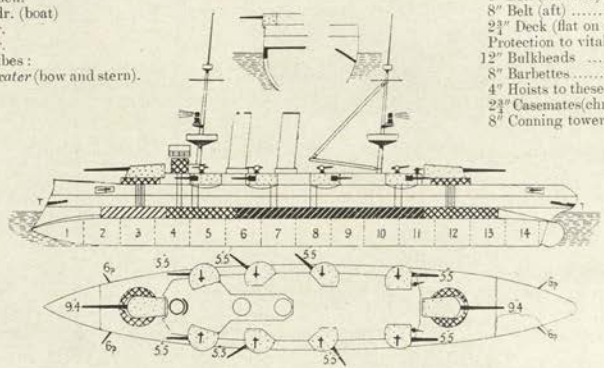
(Cataluña Class—2 Ships).

PRINCESA DE ASTURIAS (1896) & **CATALUNA** (1900).

Displacement, 7000 tons. Complement, 497.
Length (*p.p.*), 348 feet. Beam, 60¼ feet. *Maximum* draught, 25 feet. Length *over all*, 375 feet.

Guns:
2—9·4 inch.
8—5·5 inch.
2—12 pdr. (boat)
8—6 pdr.
8—3 pdr.
Torpedo tubes:
2 *above water* (bow and stern).

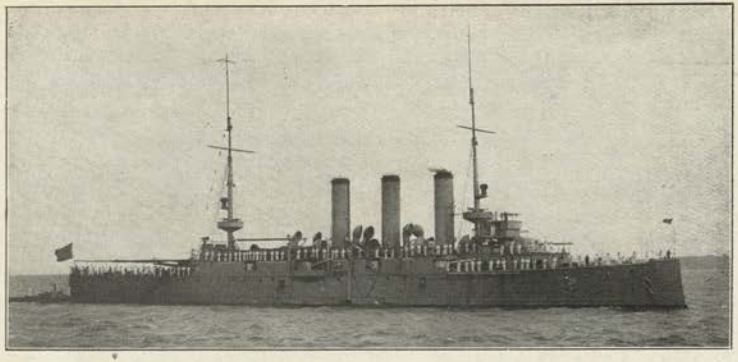
Armour (Harvey):
12″ Belt (amidships) .....*aa*
6″ Belt (forward) ..... *c*
8″ Belt (aft) ..... *b*
2¾″ Deck (flat on belt).....
Protection to vitals is .....*aa*
12″ Bulkheads .....*aa*
8″ Barbettes ..... *b*
4″ Hoists to these..... *d*
2¾″ Casemates (chrome steel) *e*
8″ Conning tower (fore) ... *b*



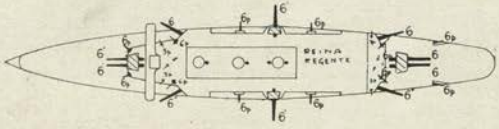
Broadside: 2—9·4 in., 4—5·5 in.

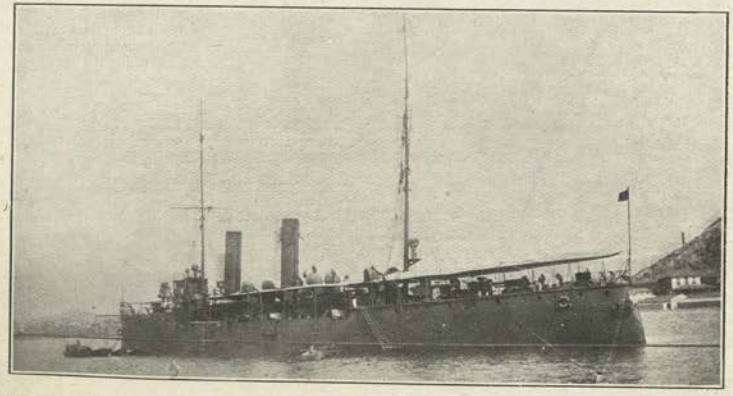
Machinery: 2 sets horizontal triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. *natural* 10,000=18 kts.; *forced* 15,000=20·25 kts. Coal: *normal* 750 tons; *maximum* 1200 tons.

Note.—The belt is 5½ feet wide and 230 feet long. The ships took over 13 years to complete.

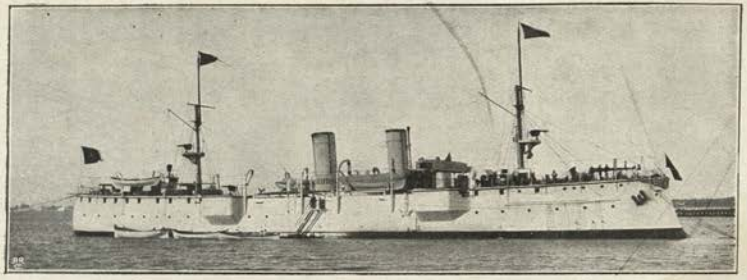


REINA REGENTE (Sept., 1906). 5372 tons. Complement, 497. Dimensions: 338×52½×19½ feet. Guns: 10—6 inch, 12—6 pdr., 8—3 pdr., 2—3 inch Field. Armour: 3½″ Deck and C.T., 3″ Gun Shields. Machinery: Reciprocating. 2 screws. Boilers: Belleville. Designed H.P. 11,000=21 kts. Coal: 1285 tons.

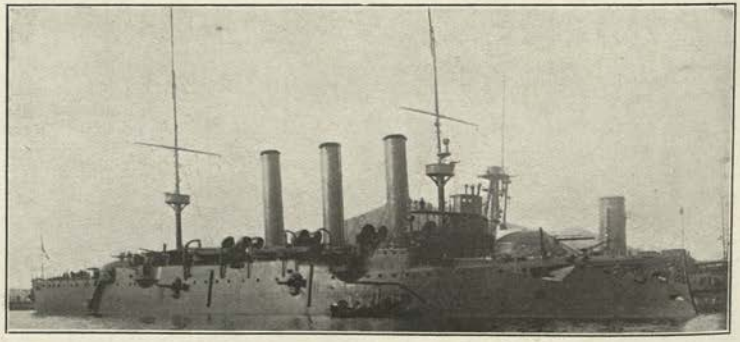




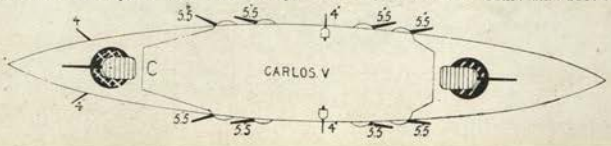
EXTRAMADURA (1900). 2030 tons. Complement, 260. Dimensions: 288×36×14½ feet. Guns: 8—4 inch (Vickers), 2—6 pdr., 4—1 pdr., 4—12 pdr. boat. No tubes. Armour: 1¼″ Deck. Machinery: 2 screws. Boilers: Thornycroft. H.P. 7800=18 kts. Coal: *max.* 210 tons.



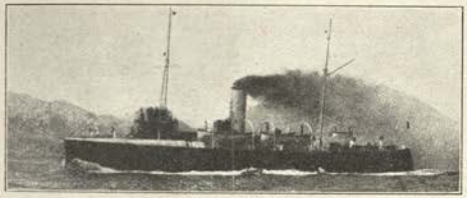
RIO DE LA PLATA (Havre, 1898). 1713 tons. Comp., 213. Dimensions: 246 × 35½ × 16 feet. Guns: 2—5·5 inch, 35 cal., 4—4 inch, 6—6 pdr., 4—1 pdr. No tubes. Armour: 1½″ Deck. Machinery: Reciprocating. 2 screws. Boilers: Normand-Sigaudy. H.P. 6793=20 kts. Coal: *max.* 260 tons.



EMPERADOR CARLOS V. (1895). 9200 tons. Comp., 600. Dimensions: 403×67×28½ feet. Armament: 2—9·4 inch, 8—5·5 inch, 4—4 inch, 2—12 pdr. boat, 8—6 pdr., 8—1 pdr., 2 Machine. Torpedo tubes (14 inch): 2 *above water*. Armour: 2½″ Deck, 10″ Barbettes with 4″ Hoods and 8″ Hoists, 2″ over Battery, 12″ C.T. Boilers: cyl. H.P. 18,500=20 kts. Coal: *max* 2000 tons.



Gunboats.



BONIFAZ (1911), **LAURIA** (1911), **LAYA** (1910), **RECALDE** (1910). 800 tons. Guns: 4—12 pdr. 2 machine. Speeds: 13 kts. Made 14·5 kts. on trial. Yarrow boilers. Radius, 3000 at 10 kts.

Photo (1914) Alferez de Navio, M. Mille.

DONA MARIA DE MOLINA (1896), **MARQUES DE LA VICTORIA** (1897), **DON ALVARO DE BAZAN** (1897). 830 tons. Complement, 89. Guns: 2—6 pdr., 4 Maxims. Torpedo tubes: *None*. Armour: 6″ Conning tower. Designed H.P. 3500=19·5 kts. (present speed much less). Coal: 120 tons.

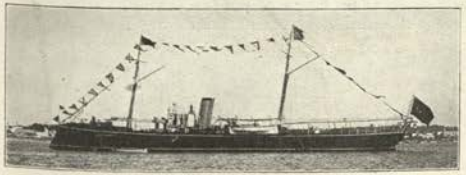


Photo by favour of Major Mannsell

NUEVA ESPANA (1889). Displacement, 630 tons. Complement, 80. Guns: 2—old 4·7 inch, 4—6 pdr. Designed H.P. 2600=19·2 kts. (present speeds about 12 kts.) Coal: *maximum* 130 tons.

Other Gunboats.

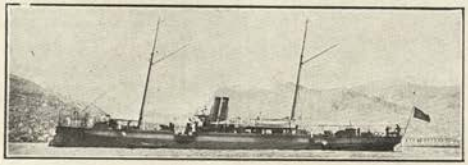


Photo (1914), Alferez de Navio, M. Mille.

TEMERARIO (1889), & **MARQUES DE MOLINS** (1892). 570 tons. Guns: 6—12 pdr., 1—1 pdr. Speed, 11 kts.

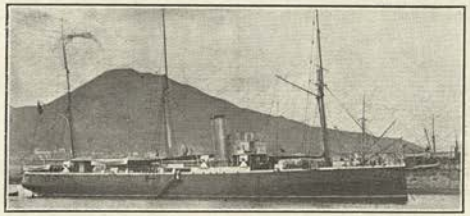


Photo (1914), Alferez de Navio, M. Mille.

INFANTA ISABEL (1885) (reconstructed 1911). 1320 tons. Guns: 1—12 pdr., 10—6 pdr. Speed, 15 kts. 1 screw. Coal: 200 tons.

VASCO NUNEZ DE BALBOA (1895) & **HERNÁN CORTES** (1895). 300 tons. Guns: 2—3 pdr., 2 Maxims. Speed 11 kts. 1 screw. *Nominal* radius, 2500 miles.

PONCE DE LEON (1896). 250 tons. Guns: 2—6 pdr., 2 Maxims. Speed, 9 kts. 1 screw.

MAC-MAHON (1889). 120 tons. Guns: 2—3 pdr., 1 Maxim. Speed, 9 kts.

GENERAL CONCHA (1883). 520 tons. Guns: 4—3 pdr., 3 Maxims. Speed 11 kts. 2 screws. *Nominal* radius, 1900.

Surveying.

URANIA (1895). 800 tons. Guns: 2—6 pdr. Speed, 10 kts. 1 screw. *Nominal* radius, 6400 at 8 kts.

Gunnery Ship.

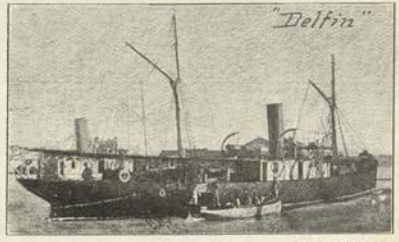
NUMANCIA (1863). 7300 tons.

Transport.

Photo (1914), Alferez de Navio, M. Mille.

ALMIRANTE LOBO (1909). 2800 tons. Guns: 2—6 pdr. Speed, 12 kts. *Nominal* radius, 4540 at 10 kts.

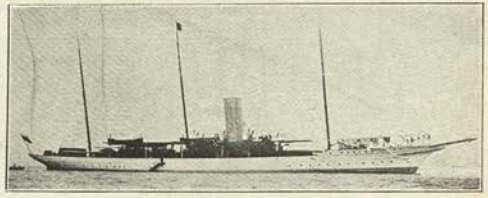
Fishery Cruisers.



Photo, Teniente Miller.

DELFIN, DORADO, GAVIOTA (1910-11). 160 tons. Speed, 11 kts.

Royal Yacht.

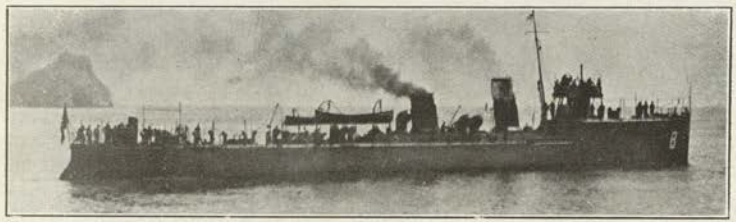


GIRALDA (1894). 2450 tons. Armament: 2—6 pdr. 2″ Belt (amidships). Speed, 20·9 kts.

7 Destroyers.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			feet
9	*pro.*	*pro.*	700	...	...	...	...	...	...
3	*Bustamente* (V)	'10-'11	380	6250(*t*)	28	...	...	2	...
1	*Proserpina* (C)	1897	460	7500	30	90	70	2	7½
2	*Audaz* (C)	1897	430	7500	30	100	67	2	7½
1	*Terror* (C)	1896	450	6000	28	100	67	2	7½

C = Clydebank. V = Vickers, etc., built in Spain.



Bustamente class named **Bustamente, Villamil, Cadarso** (*ex Requesens*). Armament: 5—6 pdr., 2—18 inch tubes. Yarrow or Normand boilers. Parsons turbine. 3 screws.

Audaz.

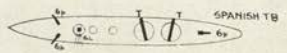
Osado.

Audaz class:—**Audaz, Osado**; also **Proserpina** and **Terror**. Armament: 2—14 pdr., 2—6 pdr., 2—15 inch tubes.

24 + 5 old Torpedo Boats.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
	1st class		tons		kts.	tons			feet
24	*new* (N)	'09-'11	180	3700(*t*)	29				
1	*Halcon* (Y)	1887	108	1600	24	25	23	3	6½
1	*Habana* (T)	1887	59	730	21	16	24	2	6
2	*Acevedo* (T)	1885	65	660	20	18	20	2	7
1	*Orion* (K)	1885	85	1000	21	16	18	2	4

K = Krupp (Gaarden). T = Thornycroft. N = Vickers, etc. (Normand design). Y = Yarrow.



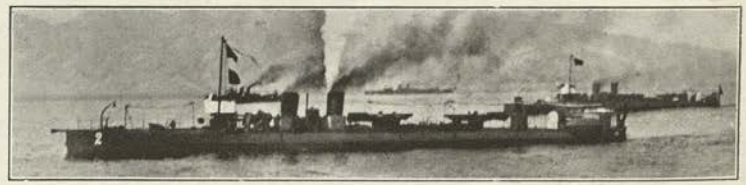


Photo by favour of Alferez Mille.

24—1 ('09-'11). 180 tons. Armament: 3—6 pdr., 2—18 in. tubes (single, aft). H.P. 3700 = 29 kts. Parsons turbines. Normand boilers. 3 screws (1—7). 2 screws (8—24).

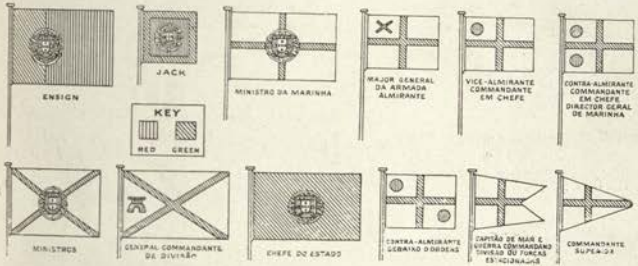
2 *Acevedo* class:—**Acevedo, Julian Ordonez.** Armament: 2 machine.
Halcon. Armament: 4—3 pdrs. 14 inch tubes. Yarrow boilers (new in 1907).
1 **Habana.**
1 **Orion.** Armament: 2—1 pdr. Yarrow boilers in 1907.

Submarine.

3 of 600 tons (sub.) to be built at Cartagena, 1915-14.

PORTUGUESE FLEET.

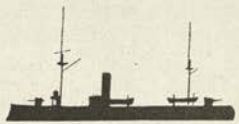
Revised by order of the Minister of Marine.



P cone.

Identification and Signal Silhouettes.

AB Save *class* (2)



BG S. Gabriel.

CH Beira *class* (2)

DM Rio Sado.

EM Diu.

EN Zaire.

GA Patria.

HF Vasco da Gama.

IF Adamastor.

IG Republica.

IH 5 de Otoubro.

IJ Almirante Reis.

Base: (1) Lisbon, 4 small docks. New docks projected.

Mercantile Marine: 66 steamers of *about* 70,000 tons, *about* 259 sailing of *about* 44,000 tons

Trade Ports: Lisbon and Oporto.

Oversea Possessions: Cape Verde Islands, Guinea (Senegambia), St. Thomas and Prince Islands (Gulf of Guinea), Timor (East Indies), Goa, Damao and Diu (India), Macao (China), Angola (Congo), Portuguese East Africa.

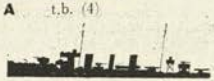
Coinage: Escudo (1000 reis) = 4s. 5d. British, $1.06 U.S.A.; 4500 reis = £1 English.

New Programme.

3—20,000 ton battleships.
3 cruisers.
12 destroyers of 820 tons.
6 submarines of 350 tons.
3 wireless stations.

PT cone. TORPEDO CRAFT.

A t.b. (4)



L Douro *class* (2)

F Tejo (reconstructed).

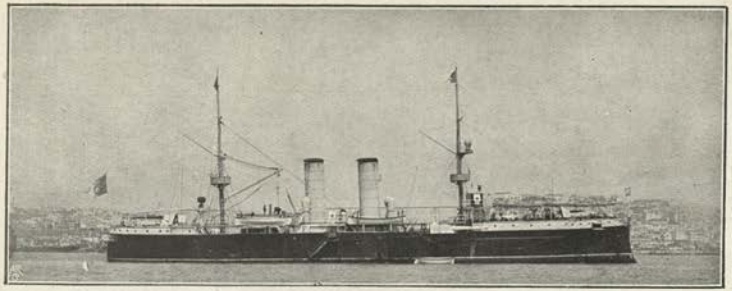
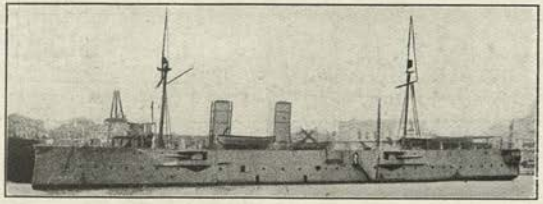
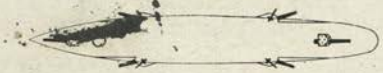


Photo by favour of C. de Grave Sells, Esq.

VASCO DA GAMA (1875, reconstructed 1902). 3030 tons. Comp., 259. Dimensions: 234×40×17⅛ feet. Guns: 2—8 inch, 1—6 inch, 1—12 pdr., 8—3 pdr., 4 Machine. No torpedoes. Armour (iron): 9″—7″ Belt, 8″ (Terni) Barbettes. Designed H.P. (new): 6000=15·09 kts. Coal: 468 tons.



REPUBLICA (*ex R. D. Amelia*) (1899). 1683 tons. Comp., 263. Dimensions: 246×36×14⅜ feet. Guns: 4—6 inch, 45 cal., 2—4 inch, 45 cal., 4—[illegible] 2—1 pdr. 2—18 inch tubes (*above water*) 1½″ Deck, 2″ C.T. Boilers: Normand. Designed H.P. 5400=18 kts. Coal: 322 tons.



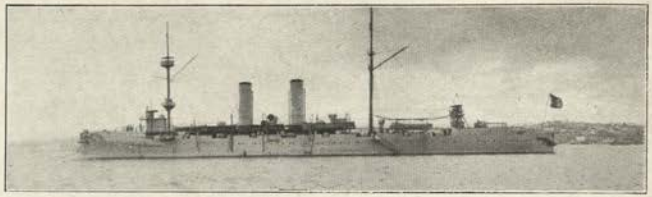
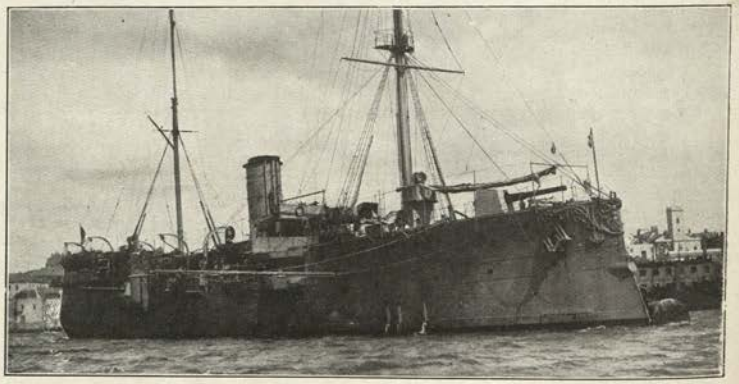


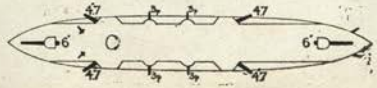
Photo by favour of Major Maunsell, R.A.

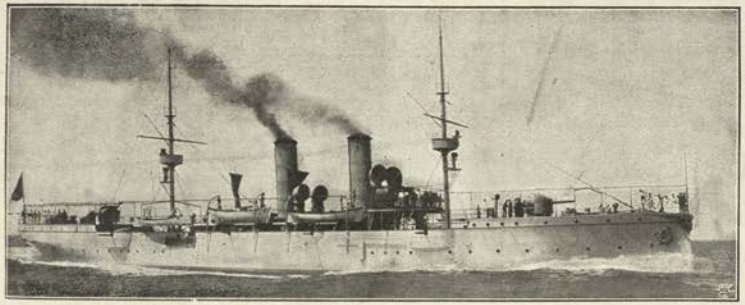
ALMIRANTE REIS (*ex* Dom Carlos I.) (1898). 4253 tons. Comp., 418. Dimensions: 360×47¼×17½ feet. Guns: 4—6 inch, 45 cal., 8—4·7 inch, 45 cal., 14—3 pdr., 2—1 pdr., 3 Machine. Torpedo tubes (18 inch): 2 *submerged*, 3 *above water* (broadside and stern). Deck, 4½″. Boilers: 12 Yarrow. H.P. *forced*, 12,500=22 kts. Coal: 922 tons.



Photo, Abrahams & Sons.

SÃO GABRIEL (1898). 1800 tons. Comp., 242. Dimensions: 246 × 35½ × 16 feet. Armament: 2—6 inch, 4—4·7 inch, 8—3 pdr., 2—1 pdr., 3 Machine. Torpedo tubes: 1—18 inch (bow) *above water*. 12″ Belt, 2½″ C.T. H.P. 4000=17 kts. Coal: 333 tons. Boilers: Normand-Sigaudy.





ADAMASTOR (1896). 1757 tons. Comp., 235. Dimensions: 242½ × 35 × 15¼ feet. Armament: 2—6 inch, 4—4·7 inch, 4—6 pdr., 2—1 pdr., 3 M. Torpedo tubes (18 inch): 3 *above water* (bow and broadside). Boilers: 4 cylindrical. H.P. *forced* 4000 = 18 kts. Coal: 420 tons.

3 Destroyers.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Coal	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			feet
6	*Pro.*		850		32				
2	*Douro* (Y)	'11-'13	670	11,000	27*t*	146	73	2	$7\frac{3}{4}$
1	*Tejo*	1901	533	7000	25	155	85	2	$10\frac{5}{8}$

t = turbine. (Y) = Yarrow.

No photo available.

Douro (1913) and *unnamed* (?). 670 tons. Dimensions:

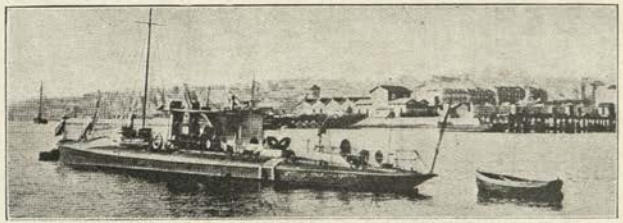
No photo available.

Tejo. Armament: 1—4 inch, 1—9 pdr., 2—3 pdr. 2—14 inch tubes. Boilers: Normand Sigaudy. Wrecked 1910; salved and reconstructed. (See Silhouettes).

4 Torpedo Boats.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Coal	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			
3	No. 2, 3, 4 (Y)	1886	66	700	19	18	18	2	7
1	No. 1 (Y)	1881	54	450	19	10	15	2	$3\frac{5}{12}$

The new boats are building in France. (Y) = Yarrow. *t* = turbine.



No. *1.* Nos. *2, 3, 4,* same type, but have mast abaft funnels.

1 Submersible.

Plot type.

Displacement, $\frac{145}{300}$ tons. Length, 149¼ feet. Beam, 13½ feet. Draught, 6½ feet. Torpedo tubes: 2.

(3 somewhat larger *pro*

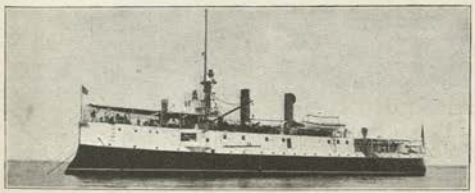
Gunboats.

No photo available. See silhouettes.

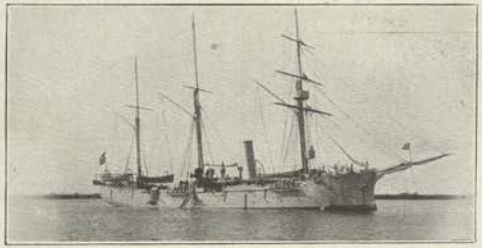
BEIRA (1911) & **IBO** (1912). 405 tons. Guns: 2—3 pdr. H.P. 700=13 kts.

No photo available. See Silhouettes.

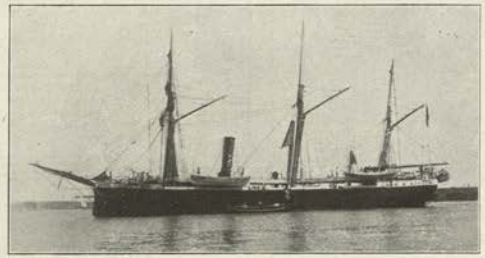
SAVE (1908) & **LURIO** (1909). 300 tons. Guns: 2—3 pdr., 1 machine. Speeds: 12·5 kts.



PATRIA (1903). 636 tons. Guns: 4—4 inch, 6—3 pdr., 1 machine. 1" water line belt. Designed H.P. 1800=16·8 kts. Niclausse boilers. Complement 157.



DIU (1889). 740 tons. Guns: 2—9 pdr., 2—3 pdr., 1—1 pdr., 1 machine. Speed, 11·5 kts.



ZAIRE (1884). 558 tons. Guns: 2—old 10 in., 2—3 pdr., 2—1 pdr. 1 machine. Nominal speed, 10 kts.

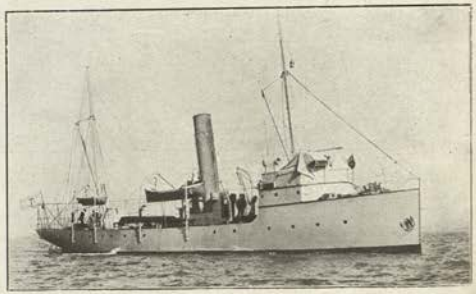
Photo, Sub-Lieut. Poyntz, R.I.M.

RIO SADO (1875). 645 tons. Guns: 2—4 inch, 2—9 pdr., 1—3 pdr. 1 machine. Nominal speed 10 kts.

River Gunboats.

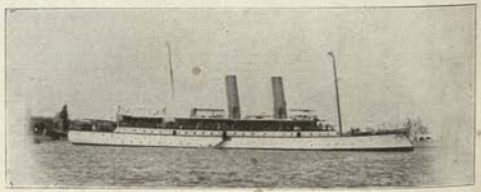
Note.—There are also 7 river gunboats.

Mine Layer.



VULCANO (1910) Built by Thornycroft. Armament: 1—18 inch tube aft. 2 dropping gears forward. Designed H.P. 400=12 kts. Radius, 1000 at 10 kts.

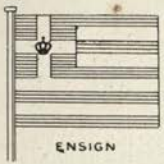
Aviso.

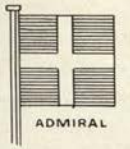


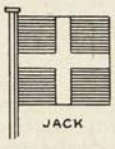
Ex- Royal Yacht **5 DE OTOUBRO** (*Ex. Amelia, Ex Banshee*). (1899). 1305 tons. Guns: 2—3 pdr., 4—1 pdr.

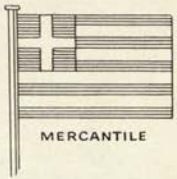
GREEK FLEET.

(Officially revised, 1914, by order of the Minister of Marine).









Blue

White

Red

Arsenal: Salamis.
Mercantile Marine: 287 steamers of 304,430 tons, 1035 sailing of about 145,000 tons.
Chief Ports: Piræus, Syra, Volo, and Salonika.
Overseas trade chiefly with England, Russia, and Austria.
Coinage: Drachma (100 lepta) = about 9½d. British, 18 cents U.S.A.
Personnel: About 4000 (conscript 2 years or enlistment).

Navarchos. *Admiral.* | Antinavarchos. *Vice-Admiral.* | Yponavarchos. *Rear-Admiral.* | Ploiarchos. *Captain.* | Antiploiarchos. *Commander, 1st class*

Plotarchis. *Comdr. 2nd class.* | Ypoploiarchos. *Lieutenant.* | Anthy-popoiarchos. *Sub.-Lieut.* | Simaiophoros. *Midshipman.*

Other branches, without the curl :—

Surgeons: *purple velvet.*
Apothecaries: *green velvet.*
Constructors: *black velvet.*
Engineers: *violet velvet.*
Paymasters: *scarlet cloth.*

O cone.

AB Mine layers.

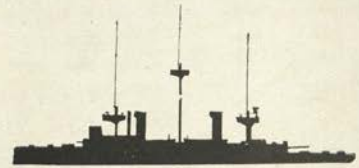
BQ Old Gunboats.

GF Helle.

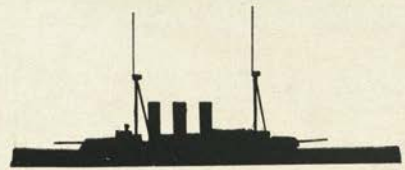
GH Kanaris.

GI Amphitrite (Royal Yacht).

JH Spetsai & Hydra.



JH Psara.



NI Averoff.

OT cone.

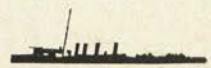
A Nikopolis (1).

G No. 10—11 (5 boats).

H Aigli *class* t.b. (2).

J Keravnos *class* t.b.d. (2).

N Doxa *class* t.b.d. (4).



V Thyella *class* t.b.d. (4).

X Aetos *class* t.b.d. (4).

GREEK BATTLE CRUISER.

New Programme.

1 battleship (St. Nazaire) of the *Lorraine* type. Details not yet decided.

1 cruiser (in England) of the *Arethusa* type.

4 ocean going destroyers.

SALAMIS (building).

Displacement, 19,500 tons. Complement,

Length (*waterline*), 570¾ feet. Beam, 82 feet. *Mean* draught, 25¼ feet.

Guns (Bethlehem):
8—14 inch, 45 cal.
12—6 inch, 50 cal.
Torpedo tubes:

Armour (Bethlehem):
10″ Belt (amidships)..... *aaa*
4″ Belt (ends) .....
12″—8″ Turrets .....
6″ Secondary guns..... *b*
12″ Conning tower .....

Machinery: A.E.G. (Curtis) turbine, 3 shaft. 3 screws. Boilers. Designed H.P. 40,000=23 kts.
Coal: *normal*, tons; *maximum*, tons+ tons oil.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*First Trials*	*Turbines*	*Boilers*	*Best recent speed*
Salamis	Vulkan Co.	Vulkan Co.	1913	*To be '15*		Curtis		

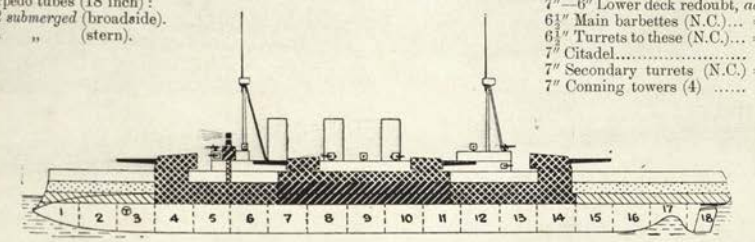
AVEROFF (March, 1910).

Normal displacement, 10,118 metric tons. Complement, 550.

Length (*over all*), 461 feet. Beam, 69 feet. *Maximum* draught, 24½ feet. (Length (*p.p.*), 426 feet.)

Guns (Elswick):
4—9·2 inch, 45 cal. (*AAA*).
8—7·5 inch, 45 cal. (*A*).
16—12 pdr.
2 Field 12 pdr.
Torpedo tubes (18 inch):
2 *submerged* (broadside).
1 „ (stern).

Armour (Terni):
8″ Belt (amidships)..... *aa*
3½″ Belt (ends)..... *e*
Deck .....
Protection to vitals..... *aaa*
7″—6″ Lower deck redoubt, *aa-a*
6½″ Main barbettes (N.C.)... =*a*
6½″ Turrets to these (N.C.)... =*a*
7″ Citadel..... *a*
7″ Secondary turrets (N.C.) =*a*
7″ Conning towers (4) ..... *a*



Ahead:
2—9·2 in.
4—7·5 in.

Astern:
2—9·2 in.
4—7·5 in.

Broadside: 4—9·2 in., 4—7·5 in.

Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 22 Belleville Designed H.P. 19,000=22·5 kts. Coal: *normal* 660 tons; *maximum* 1500 tons.

Gunnery Notes—All big guns electrically controlled.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Averoff	Orlando	Odero	1907	1911	21,500=23·9	Belleville	

General Notes.—Cost £950,750. Sister to Italian *Pisa* with certain modifications as to armament and rig. This is the Italian ship formerly known as "*X*." Under the will of a deceased Greek millionaire, M. Giorgios Averoff, about £300,000 was left for increasing the Navy, and this cruiser bought.

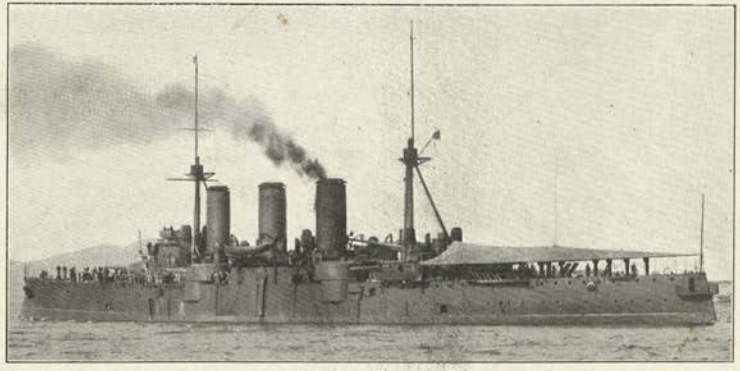
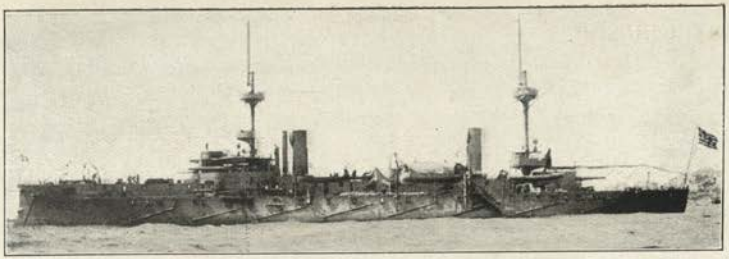


Photo by favour of M. C. B. Rontiri.



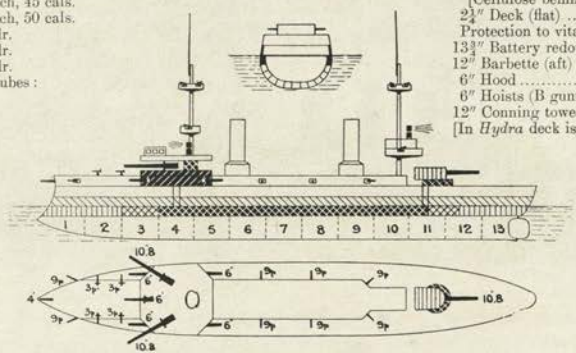
SPETSAI.

PSARA (1890), **SPETSAI** (1889), **HYDRA** (1889).

Displacement, 5000 tons. Complement, 440.
Length (*waterline*), 331 feet. Beam, 52 feet. *Maximum* draught, 24 feet.

Guns (Canet):
2—10·8 inch, 36 cals. (*B*)
1—10·8 inch, 30 cals. (*C*)
5—6 inch, 45 cals.
1—4 inch, 50 cals.
8—9 pdr.
4—3 pdr.
12—1 pdr.
Torpedo tubes:
Nil.

Armour (Creusot steel):
12″—4¾″ Belt (lower)..... *a-d*
3″ Belt (upper)..... *e*
[Cellulose behind belt].
2½″ Deck (flat)..... Protection to vitals..... = *a*
13¾″ Battery redoubt..... *aa*
12″ Barbette (aft)..... *a*
6″ Hood..... *d*
6″ Hoists (B guns)..... *d*
12″ Conning tower..... *a*
[In *Hydra* deck is 2″ only].



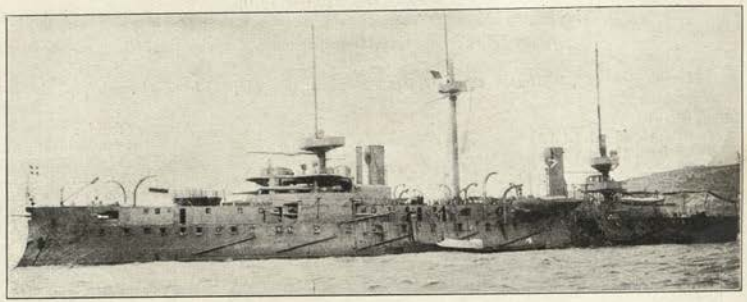
Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. 6700 = 17 kts. Coal: *normal* 400 tons; *maximum* 600 tons.

Armour Notes.—The main belt is 4 feet wide, all of it under water. The upper belt is the same width. The guns have flat shields to them, about 2″ thick.

Torpedo Notes.—Bullivant net defence fitted.

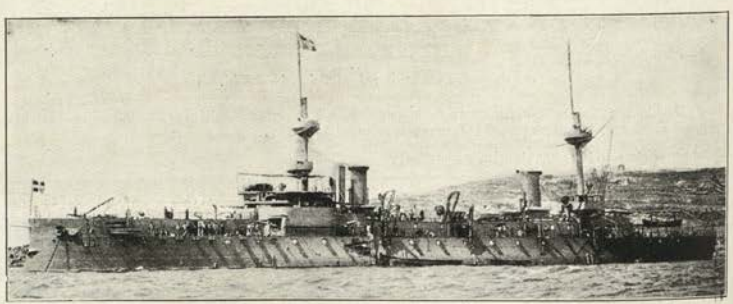
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Reconstructed*	*First trials*	*Boilers*	*Best recent speed*
Psara	Granville	F. & C. de la M.	1888	1892	1897	6899 = 17·62	Cylindrical	13·5
Spetsai	Granville	F. & C. de la M.	1887	1891	1899	6930 = 17·5	in	12
Hydra	St. Nazaire	F. & C. de la M.	1887	1891	1900	6912 = 17·4	all	12·7

General Notes.—It is proposed to reconstruct these ships.



PSARA.

Note.—All three are now fitted with flying topmasts.



HYDRA. (*Note position of funnel covers*). *All photos, Monsieur C. B. Rontiri.*

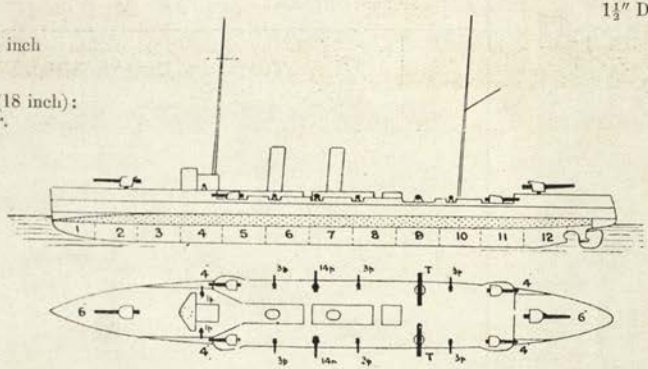
HELLE. (May, 1912).

Normal Displacement, 2600 tons. Complement, 232.

Length (*over all*), 330 feet. Beam, 42 feet. Draught, 13 feet,

Guns:—
2—6 inch.
4—4 inch.
2—14 pdr., 3 inch
6—3 pdr.
2—1 pdr.
Torpedo tubes (18 inch):
2 *above water.*

Armour (steel):
1½″ Deck on slopes ...

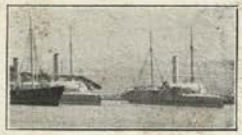


Machinery: Parsons turbine. 3 screws. Boilers: Thornycroft. Designed H.P. 6,500=20 kts.
Coal: *normal*, 400 tons; *maximum*, 600 tons.

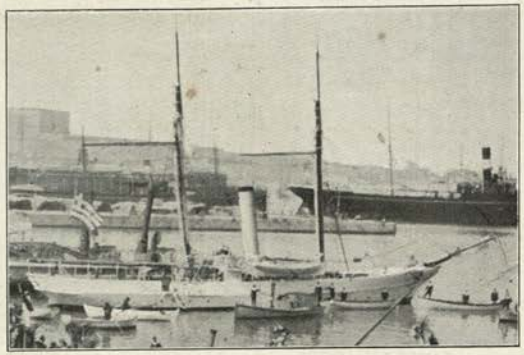
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Helle	N.Y. Shipblg.	N.Y. Shipblg.	1911	1913		Thornycroft	

Built as the *Fei-Hung* for China. Purchased 1914.

Gunboats.



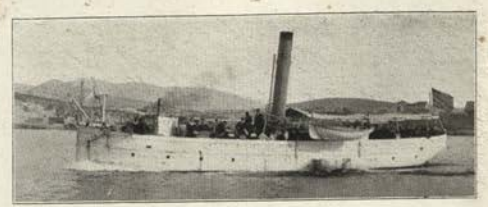
AKTION & **AMBRAKIA** (—— 1881). 484 tons. Guns: 1 old 10·2 inch Krupp. Speed: originally 11 kts.



SALAMINIA (1860), and **SYROS** (1859). 380 tons. Guns: 1—3·4 inch Krupp. *Nominal* speeds: 9 kts.

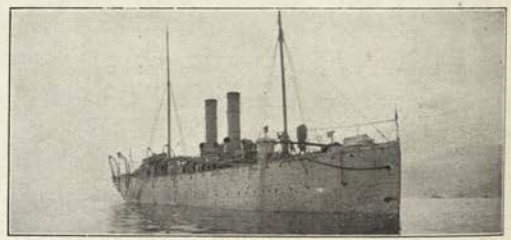
Used only for transferring crews and officers from the Naval Arsenal.

Mine Layers.



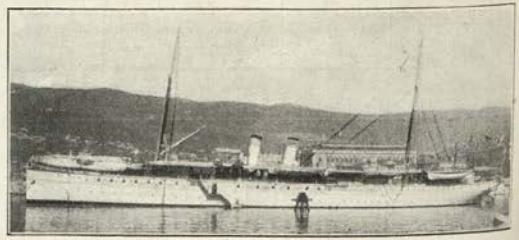
MONEMBASIA, AIGIALLA, NAUPLIA (all about 1881). 90 tons. Speeds: originally 9·5 kts.

Torpedo Depot Ship.



KANARIS (1877). 1100 tons. Guns: 2—4 inch. Torpedo tubes (*above water*): 2 in bow, 2 broadside. Can carry 4 third class boats. Original speed: 14 kts.

Royal Yacht.

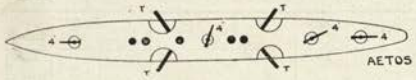


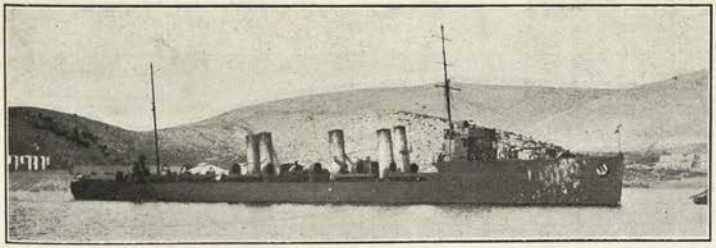
AMPHITRITE. 900 tons. Speed: originally 14 kts.
(Funnels have been lengthened since this photo was taken.)

14 Destroyers.

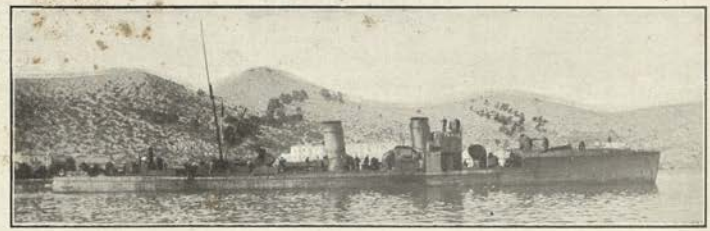
No.	Type	Date	Displacement tons	H.P.	*Max.* speed kts.	Fuel	Complement	T. tubes	*Max.* draug't
...	*Pro.*	...	...	...	...	...	...	...	...
4	*Aetos* (L)	1911	980	19,750	32	Coal 225, oil 75	110	4	10
2	*Keravnos* (V)	1911	750	...	32·5	...	...	2	...
4	*Thyella* (Y)	'06-'07	400	6000	30·5	For 2000 at 14 kts.	58	2	9
4	*Doza* (V)	'06-'07	350	6600	30·5	For 2000 at 14 kts.	58	2	9

(L) = Cammell Laird. (V) = Vulkan Co. (Y) = Yarrow.

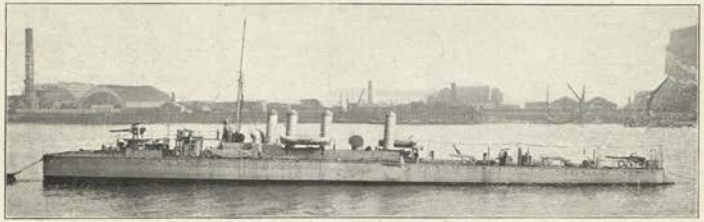




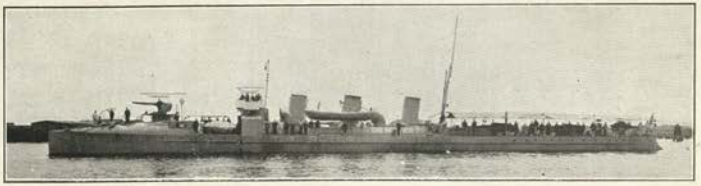
4 *Laird.* ***Aetos, Leon, Jerax, Panthir*** (——1911). 980 tons. 293×27½×10 feet. Armament: 4—4 inch Bethlehem. 4—21 inch tubes. 2 searchlights. Parsons turbines. H.P. 19,750 = 32 kts. White-Foster boilers. Coal: 225 tons. Oil: 75 tons.



2 *Vulkan.* ***Keravnos, Neagenea*** (——1911). 750 tons. Dimensions: × × feet. Armament: 4—4 inch 2—18 inch tubes H.P. = kts. Coal: tons. Oil: tons.



4 *Thyella class. Yarrow* type (1906-07), 400 tons. ***Thyella, Sfendoni, Naphkratoussa*** and ***Lonchi.*** Armament: 2—12 pdr., 4—6 pdr. 2 tubes (18 inch). Speed: 30 kts. (32 kts. reached or exceeded on trials). Coal: 80 tons. Complement: 58. Length: 220 feet. Beam: 20½ feet. *Max.* draught: 9 feet.

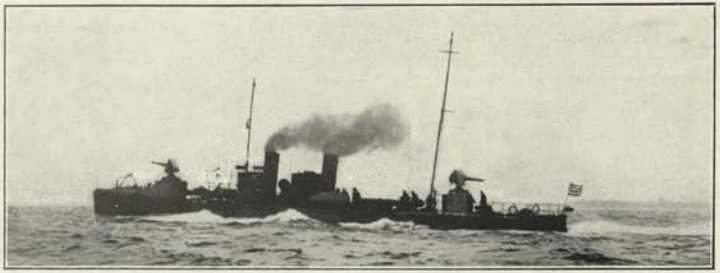


4 *Doza class. Vulkan Stettin* type (1906-7), 350 tons. ***Aspis, Niki, Doxa*** and ***Velos.*** Armament: 2—12 pdr., 4—6 pdr. 2 tubes (18 inch). Designed speed: 30 kts. Coal: 80 tons; *maximum* 92 tons. Complement: 58. *Max.* draught: 9 feet.

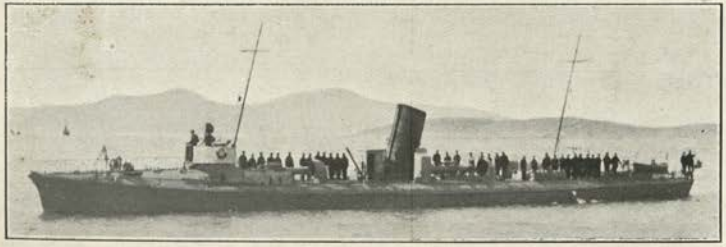
17 Torpedo Boats.

No.	Type	Date	Dis-place-ment tons	H.P.	*Max.* speed kts.	Fuel	Com-ple-ment	T. tubes	*Max.* draug't
6	*Aigli* class (V)	'12-'13	125	...	25	...	3	...	...
1	*Nikopolis* (A)	1905	165	2200	27	...	...	1	6
5	*16—11* (V)	1885	85	1050	19	20 tons coal	20	2	6

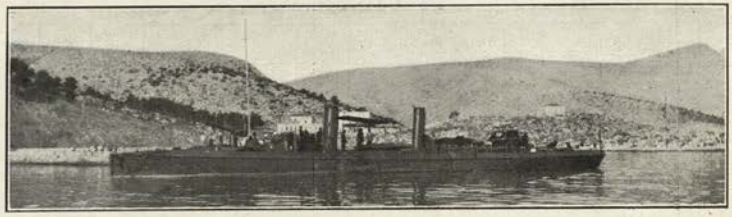
(A)=Ansaldo. (V)=Vulkan Co.



2 *Vulkan*, ***Aigli, Thetis*** (—1912), ***Daphne, Arethusa, Alcyon, Doris*** (—1913). Dimensions: × × feet. Armament 2—6 pdr. Bethlehem, 3—18 inch tubes. H.P. =25 kts. Coal: tons.



Nikopolis (ex Turkish *Antalia*) (1905). Armament: 2—6 pdr. Bethlehem (1913), 1—18 inch tube. H.P 2200=27 kts.



Vulkan boats. ***16—11*** (1885) (re-engined, etc., 1905), of 85 tons, originally 19 kts. Guns: 4—1 pdr. 2—14 inch bow tubes. Coal: 20 tons.

Submarines.

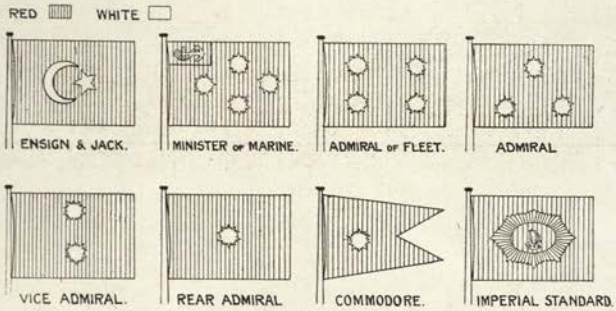
No.	Type	Date	Dis-place-ment tons	H.P.	*Max.* speed kts.	Fuel	Com-ple-ment	T. tubes	*Max.* draug't
2	*Delfin* (S)	'11-'12	$\frac{300}{460}$	...	$\frac{14}{9}$	...	...	5	...

(S)=Schneider & Co.

Delphin (1911) and ***Xiphias*** (1912). $\frac{300}{460}$ tons. *Laubeuf* type. Dimensions: 162¼ × × feet. Speed: $\frac{14}{9}$ 5—18 inch tubes. Built by Schneider & Cie, of Creusot.

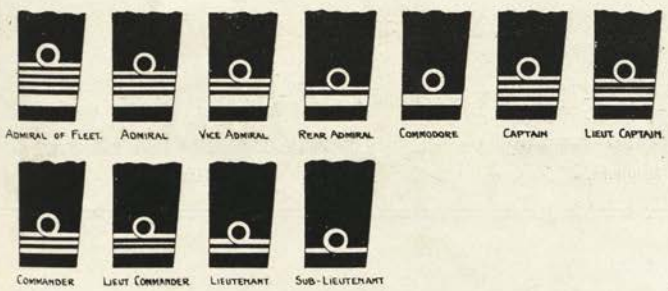
TURKISH FLEET.

Specially revised by a Turkish Naval Officer.



FLAGS, AUTHORISED 1910.

Uniforms.



INSIGNIA OF RANK, AUTHORISED 1910.

Other branches.—Without the curl.
Doctors.—Crimson.
Engineers.—Scarlet.
Constructors.—Blue.
Paymasters.—White.

Arsenal: Constantinople.

Mercantile Marine: 143 steamers of 69,833 tons net, and 900 sailing (180,000 tons).

Minister of Marine: General Mahmoud, Pacha.

Colour of ships: Grey; destroyers black.

Principal Ports: Trebizond, Sinope, Samsoun, Smyrna, Alexandretta, Beyrût, Basra, Jaffa, Hodieda, Djeddah.

Coinage: Lira (Medjidié) of 100 piastres = 18*s*. British, $4·28 U.S.A. One piastre (4 cents U.S.A.) = *about* 2*d*. British.

Personnel: 6000 all ranks.

Uniforms—(*Continued*).

Epaulettes are worn with white uniforms.

British or U.S.A.		Turkey.
Admiral of the Fleet	=	Buyuk Amiral.
Admiral	=	Amiral
Vice-Ad.	=	Vice-Amiral
Rear-Ad.	=	Liva-Amiral.
Commodore	=	Commodore.
Captain	=	Galion Capitani.
Commander	=	Fregate Capitani.
"	=	Corvette Capitani.
Lieut. (senior)	=	Birindji Yuzbachi.
Lieutenant	=	Yuzbachi.
Sub-Lieut.	=	Mulazim.
Midshipman	=	Mehendis.

BA Muin-i-Zaffer & Avnillah.

EG Aintab *class*.

FQ Marmaris.

GH Haïrredin Barbarosse *class* (2 ships).

HA Messudiyeh.

IG Pelenk-i-deria.

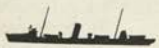
JH Peik-i-shevket *class*.

J Osman I.

MG Medjidieh.

MG Hamidiyeh.

TORPEDO CRAFT. **T** **First substitute, cone.**



A Antalia *class* (4) t.b.

G Yadikiar Milet *class* (4) t.b.d.

French *Forban* type.
2 funnels.

H Hamid Abad *class* (4) t.b.

I Samsoun *class* (4) t.b.d.

S Abdul Mejid t.b.

TURKISH DREADNOUGHT. No. **2.** (*Haty-harb-Zirchlissi.*)

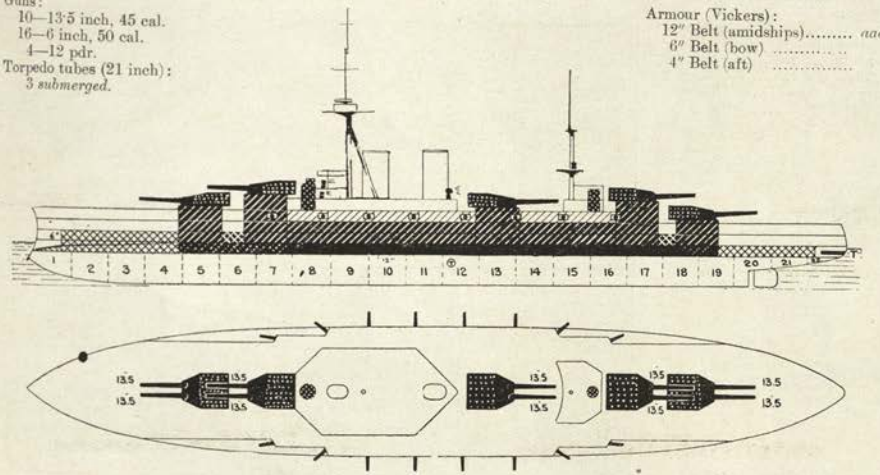
SULTAN MEHMET RECHAD. V. (1913).

Normal displacement, 23,000 tons. Complement

Length, 560 feet. Beam, 91 feet. *Maximum* draught, 29 feet.

Guns:
10—13·5 inch, 45 cal.
16—6 inch, 50 cal.
4—12 pdr.
Torpedo tubes (21 inch):
3 *submerged.*

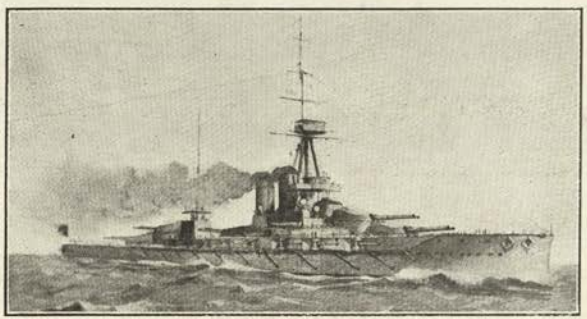
Armour (Vickers):
12″ Belt (amidships)..... *aaa*
6″ Belt (bow) .....
4″ Belt (aft) .....



Machinery: Parsons' turbine. 4 screws. Designed H.P. 20,000=21 kts. Boilers:
Coal: *normal* tons; *max.* tons. Oil: 640 tons.

Torpedo Notes.—Bullivant net defence.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed*	*Trials.*	*Boilers.*	*Turbines.*	*Best recent speed.*
S. Mehmet R.V.	Vickers		Dec. '11					



From the 1913 picture of the ship as re-designed in rig.

SULTAN OSMAN I *(ex Rio de Janeiro)*, (January, 1913).

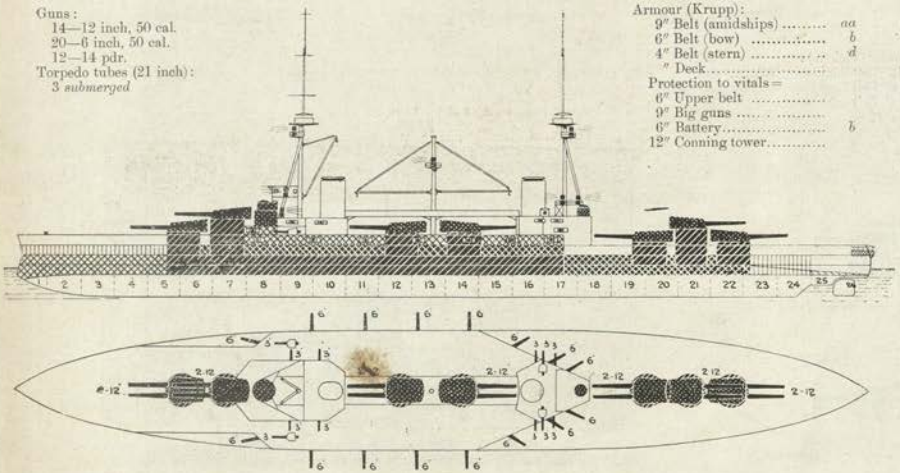
Normal displacement, 27,500 tons. Complement, 1100.

Length *over all*, 652 feet. Beam, 90½ feet. *Maximum* draught, feet. Length (*p.p.*), 631½ feet.

Guns:
14—12 inch, 50 cal.
20—6 inch, 50 cal.
12—14 pdr.
Torpedo tubes (21 inch):
3 *submerged*

Armour (Krupp):

9" Belt (amidships)	*aa*
6" Belt (bow)	*b*
4" Belt (stern)	*d*
" Deck	
Protection to vitals =	
6" Upper belt	
9" Big guns	
6" Battery	*b*
12" Conning tower	



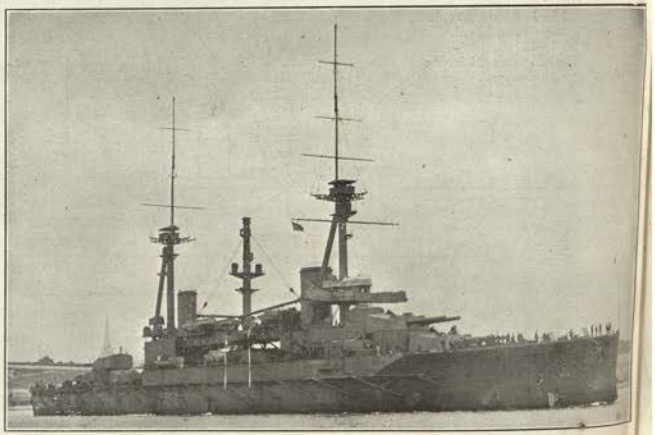
Machinery: Parsons 4-shaft turbine. Designed H.P. 45,000 = 22 kts. Coal: *normal* 1500 tons; *maximum* 3000 tons. Oil: tons.

Armour Notes.—There are three armour decks.

Torpedo Notes.—Bullivant net defence.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Osman I	Elswick	Vickers	Sept. '11	'14			

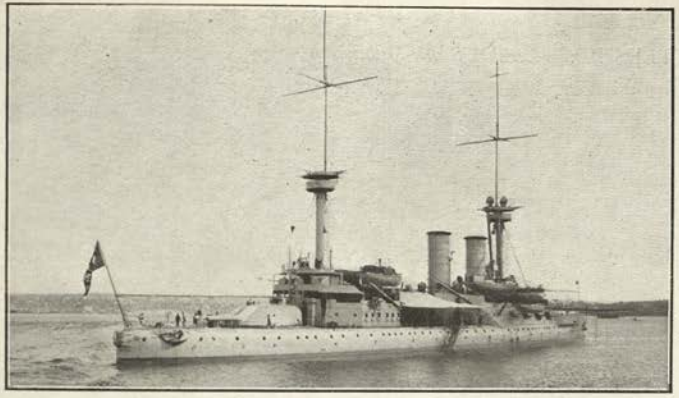
Note.—Purchased 1913 from Brazil.



Photo, Abrahams & Son.

TURKISH BATTLESHIPS. (*Haty-harb-Zirchlissi.*)

Both photos taken 1913.

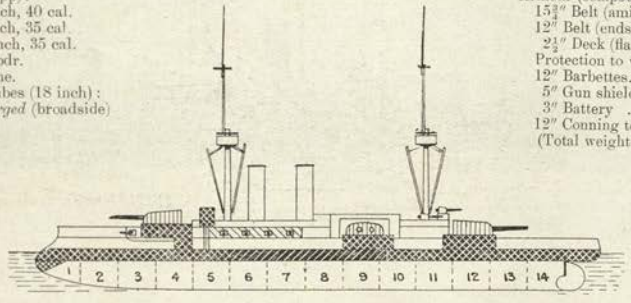


HÄIRREDIN BARBAROSSE (1891) & TORGUD REIS (1891).

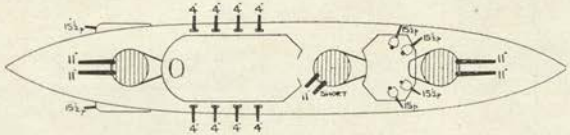
Normal displacement, 10,060 metric tons. Complement,

Guns (Krupp):
4—11 inch, 40 cal.
2—11 inch, 35 cal.
8—4·1 inch, 35 cal.
8—1½ pdr.
4 machine.
Torpedo tubes (18 inch):
2 *submerged* (broadside)

Armour (compound):
15¾″ Belt (amidships) *aa*
12″ Belt (ends) ..... *a*
2½″ Deck (flat on belt)...
Protection to vitals is *aa*
12″ Barbettes..... *a*
5″ Gun shields ..... *d*
3″ Battery ..... *e*
12″ Conning tower ... *a*
(Total weight 2800 tons).



Ahead:
2—11 in.



Astern:
2—11 in.

Broadside: 6—11 in.

Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: 12 cyl. return flame (new in 1900). Designed H.P. *forced* 10,200=17 kts. Coal: *normal* 600 tons; *max.* 1050 tons.

Gunnery Notes.—Hydraulic and hand gear for big guns.

General Notes.—These are ex-German battleships *Kurfürst Friedrich Wilhelm* and *Weissenburg*. Purchased 1910

MESSUDIYEH (1874).

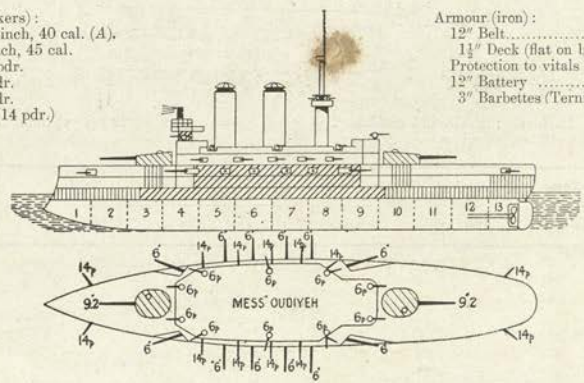
Reconstructed at Genoa, 1902.

Displacement, *circa* 10,000 tons. Complement, 600 (as flagship 640).

Length, 331 feet. Beam, 59 feet. *Maximum* draught, 27 feet.

Guns (Vickers):
2—9·2 inch, 40 cal. (*A*).
12—6 inch, 45 cal.
14—12 pdr.
10—6 pdr.
2—3 pdr.
2 Field (14 pdr.)

Armour (iron):
12″ Belt..... *c*
1½″ Deck (flat on belt) ...
Protection to vitals is ..... *c*
12″ Battery ..... *c*
3″ Barbettes (Terni) ..... *d*



Machinery: 2 sets inverted triple expansion, 4 cylinder. 2 screws. Boilers: 16 Niclausse in 4 compartments. Designed H.P. 11,000=16 kts. Coal: 600 tons.

Note.—The old armour remains, except for the barbettes and the special protection to steering gear, &c., aft.

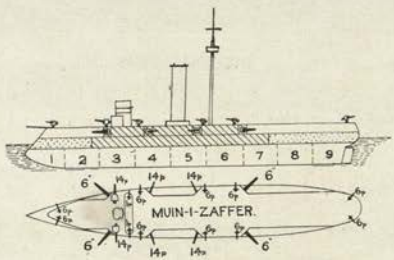
TURKISH COAST DEFENCE BATTLESHIP. (*Zirchli Sahil-Muhafisi.*)

MUIN-I-ZAFFER (1869), (Rebuilt by Ansaldo 1904-7.)

Actual displacement, 2400 tons. Complement, 220.

Length (*waterline*), 229 feet. Beam, 36 feet. *Mean* draught, 16½ feet.

Guns (Krupp, M. '06):
4—6 inch, 40 cal.
6—3 inch, 14½ pdr.
10—6 pdr.
2—1 pdr.
Torpedo tubes:
nil.



Armour (old, iron):
6″—3″ Battery ... *e-f*
6″ Battery..... *e*
5″ Bulkheads ..... *e*

Machinery: Horizontal compound. 1 screw. Boilers (new in 1906). Cylindrical. Designed H.P. 2200=12 kts. Coal (*max.*): 250 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Refit*	*Trials.*	*Boilers*	*Best recent speed*
Muin-i-Zaffer	Blackwall	Samuda	1867	1871	'04-'07	2200=12 kts.	Cyl.	12

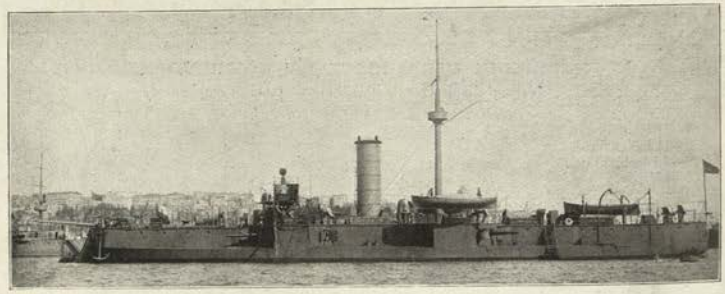
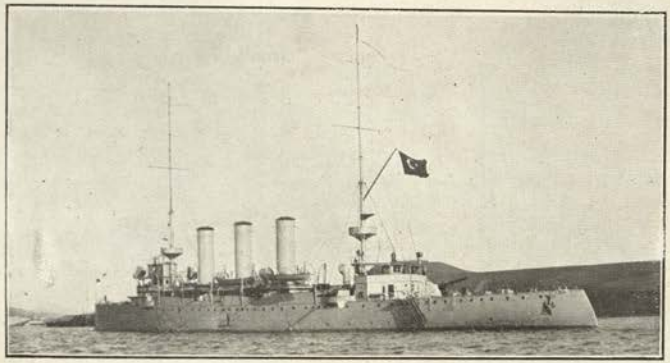


Photo by favour of Commander N. Soiani.

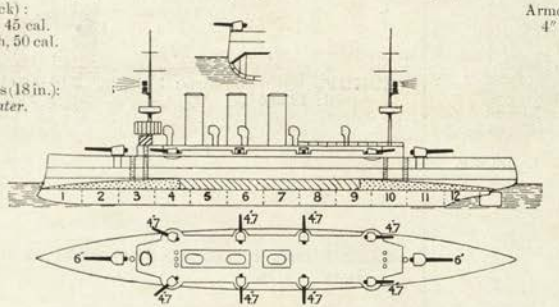


Differences.—*Medjidieh* (see next) has higher ventilators than *Hamidieh*.

HAMIDIEH (*ex Abdul Hamid*) (1903).
Displacement, 3800 tons. Complement, 302.
Length, 345 feet. Beam, 47½ feet. *Maximum* draught, 16 feet.

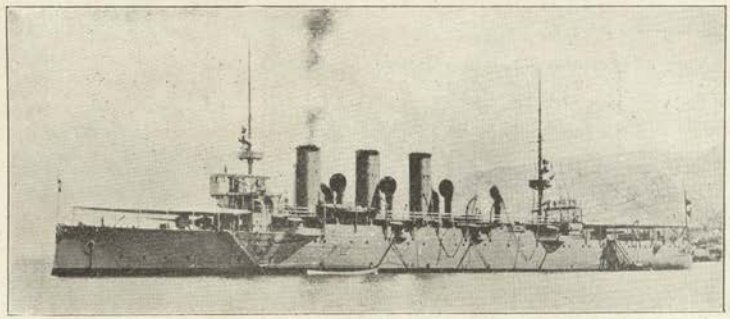
Guns (Elswick):
2—6 inch, 45 cal.
8—4·7 inch, 50 cal.
2—3 pdr.
2—1 pdr.
Torpedo tubes (18 in.):
3 *above water*.

Armour:
4″ Deck ... =€



Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. 12,000 = 22kts. (*forced draught*) (190 revs.). Coal: *normal* 275 tons; *maximum* 600 tons.

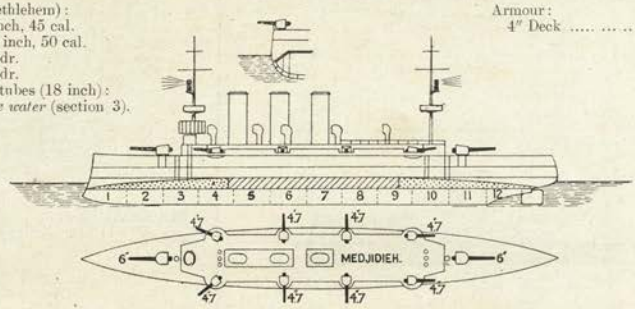
Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Hamidieh	Elswick	Hawthorn L.	1902	1904	=21·1 12,500=22·2	Cyl.	



MEDJIDIEH (1903).
Normal displacement, 3330 tons. Complement, 312.
Length (*waterline*), 331 feet. Beam, 43 feet. *Max.* draught, 17 feet,

Guns (Bethlehem):
2—6 inch, 45 cal.
8—4·7 inch, 50 cal.
6—3 pdr.
6—1 pdr.
Torpedo tubes (18 inch):
2 *above water* (section 3).

Armour:
4″ Deck ....= c



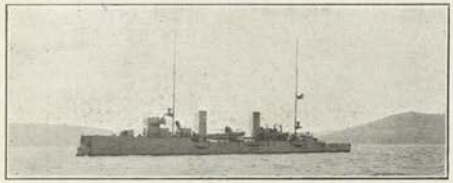
Machinery: 2 sets vertical triple expansion. Boilers: 16 Niclausse (retubed 1910). Designed H.P. 12,500 = 22 kts. Coal: *normal*, 300 tons; *maximum*, 600 tons.

Gunnery Notes.—Hoists for 4·7's are three in a row abreast end guns.

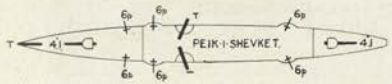
Engineering Notes.—Heating surface 27,882 square feet, grate surface 775 square feet. Steam pressure: 275 lbs. Screws: 3-bladed. The full coal supply immerses the ship 12 in. more.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*Trials*	*Boilers*	*Best recent speed*
Medjidieh	Cramp	Cramp	Nov.'01	1904		=22·2	Niclausse	22

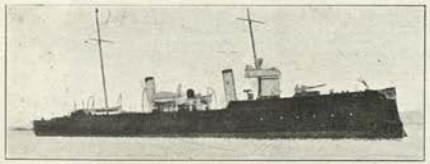
Torpedo Gunboats (*Torpedo Muhribi*).



PEIK-I-SHEVKET (1906) & **BERKI-SATVET** (1906). 775 tons. Guns (Krupp): 2—4·1 inch, 6—6 pdr., 2—1 pdr., 5 machine. 3—18 inch tubes. Designed H.P. 5100 = 22 kts. Coal: 240 tons.



Built and designed by Krupps.



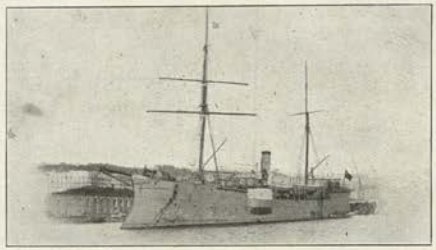
PELENK-I-DERIA (1890). 775 tons. Guns: 2—4 inch Krupp, 6—3 pdrs., 3—14 in. tubes. Designed H.P. 4500 = 19 kts.

Gunboats (*Ganbot*).

Building in France.

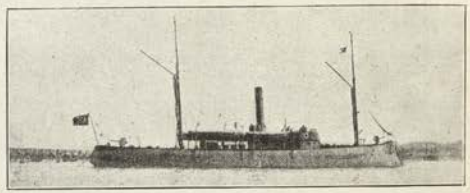
BURAK REIS, SEIDI-REIS, KERNAL-REIS, MURAD REIS. 500 tons. Guns: 2—4 inch, 2—6 pdr., 2 Maxims. Speed: 15 kts.

3 of 420 tons. Guns: 3—3 inch, 2—6 pdr., 2 Maxims. Speed: 15 kts.

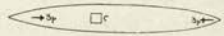


MARMARIS (1907). 500 tons. Guns: 4—9 pdr., 2—1 pdr., H.P. 950 = 14 kts. Built by Schneider-Canet, at Creusot.

Gunboats (*Continued*).



NERCHEHIR (1909), **TACHKEUPRU** (1909). 213 tons. Armament: 2—3 pdr. H.P. 340 = 12 kts. (Five others of this class sunk in the war with Italy.)



Used as Mine Layer.

ZUHOF. 650 tons. Guns: 4 –1 pdr. 2 torpedo tubes. Original speed: 12 kts.

CASTAMONI & **YOZGAD** (1906). 185 tons. Guns: 2—3 pdr. Speed: 12 kts.

NOURILBAHIR (—1903). About 198 tons. Guns: 4—12 pdr., 2—3 pdr. 2 tubes. 12 kts.

Torpedo Depot Ship.

ALI PACHA (*ex Port Royal*). Purchased 1911.

Hospital Ship.

MIDHAT PACHA (*ex Port Ontario*). Purchased 1911.

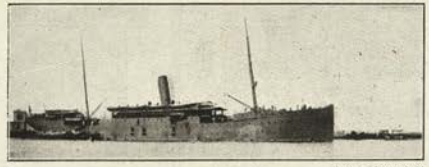
Transports (War Office).

GUL DJENIAD (*ex Ottawa, ex Germanic*). Purchased 1911.

Transports (War Office)—(*Continued*).

KARIA DENIZ (*ex Darmstadt*). All purchased 1911.
AK DENIZ (*ex Oldenburg*).
BAHR AHMED (*ex Roland*).

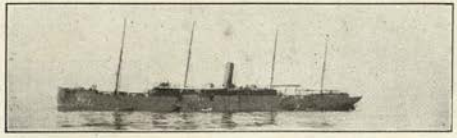
Naval Transport.



Photo, Spartiali.

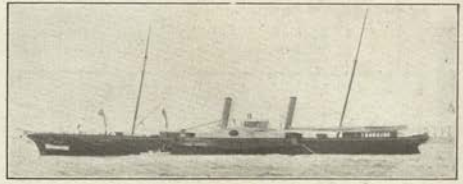
BEZZM-Y-ALEM.

Repair Ship.



TIRI-MUJGIAN. *Photo, Spartiali*

Despatch Vessels.



Photo, Spartiali.

IZZEDIN, ISMAIL, THALIA (—1865). About 1200 tons. Guns: 3—3·5. Original speed: 16 kts.
(*Fouat* of this class sunk at Salonika.)

Imperial Yacht.

ERTOGRUL (Elswick, 1903). 900 tons. Guns: 8—3 pdr. H.P. 2500 = 21 kts.

Mine Ship.

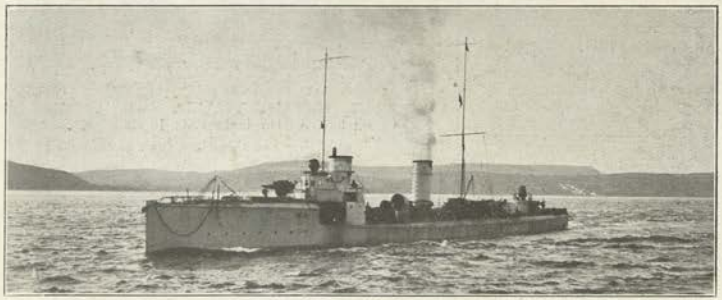
Completing.

MUSRAT (Krupp, 1913). Length: 131½ feet. Armament: 8 machine guns. Speed: 15 kts.

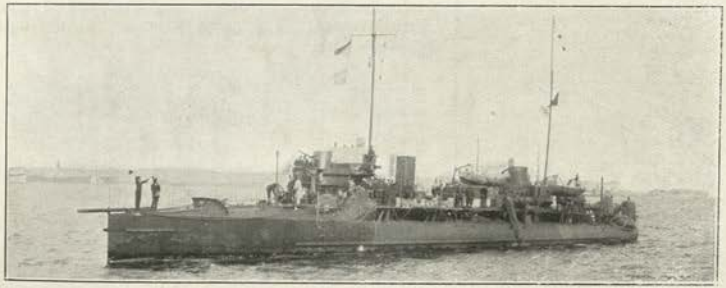
8 Destroyers + 12 pro.

No.	Type	Date	Displacement	H.P.	Max. speed	Fuel	Complement	T. tubes	Max. draug't
			tons		kts.	tons			feet
12		*pro.*							
4	*Yadikiar Milet* (S)	'09-'10	620	10,250	35	160	83	3	10
4	*Samsoun* (L)	'07-'10	305	6000	28			2	12½

Photos on this page except Younis are all war ones. (S)=Schichau. (L)=Chantiers de la Loire.



4 *Schichau* boats. ***Yadikar-Milet; Mouavenet-Milieh, Noumounei-Hamiet,*** and ***Gairet-Vatandeh.*** All 1909. 620 tons. Armament: 2—12 pdr., 2–6 pdr., 2–1 pdr., 3—18 in. tubes. On trials from 36·2 to 34·5 kts.



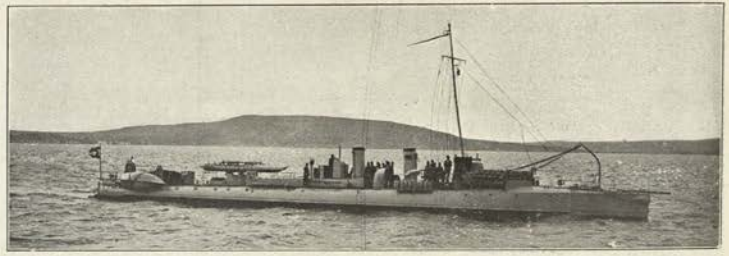
Samsoun (1907), ***Basra*** (1907), ***Tassos*** (1908), ***Yar-Hissar*** (1907). Armament: 1—12 pdr., 6—3 pdr., 2—18 inch tubes.

Submarines.—3 *pro.*

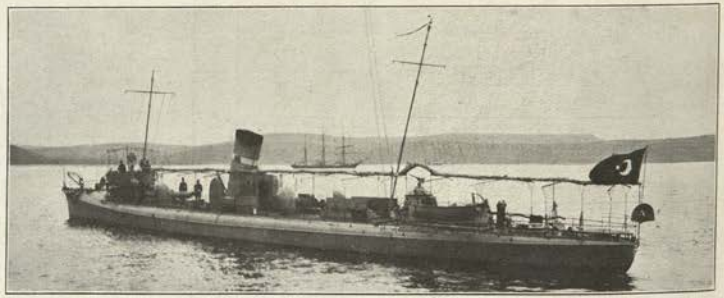
9 Torpedo Boats.

No.	Type	Date	Displacement	H.P.	Max. speed	Fuel	Complement	T tubes	Max. draug't
			tons		kts.	tons			feet
4	*Hamid Abad* (C)	'06-'07	97	1900	26			3	
4	*Antalia* (A)	'04-'07	165	2200	27			1	6
1	*Younis* (A)	1901	145	1900	27			1	

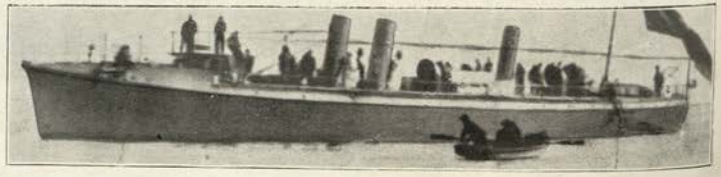
(A)=Ansaldo. (C)=Creusot. (Five other boats lost in Italian War, and one in the Greek War.)



Hamid-Abad, Sultan-Hissar, Sivre-Hissar and ***Timur-Hissar.*** Armament: 2—1 pdr., 3—8 inch tubes.



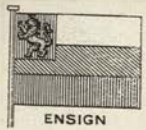
165 ton Ansaldo boats ***Qutahia, Mosoul, Tocad*** and ***Ak-Hissar.*** Armament: 2–3 pdr., 1–18 in. tube.

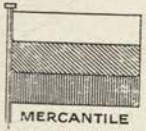


The 145 ton Ansaldo boat is named ***Younis.*** Armament: 2—3 pdr., 1–18 inch tube.

BULGARIAN NAVY.

(Officially revised by the Ministry of Marine.)



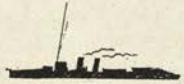


BA cone.

KROUM.

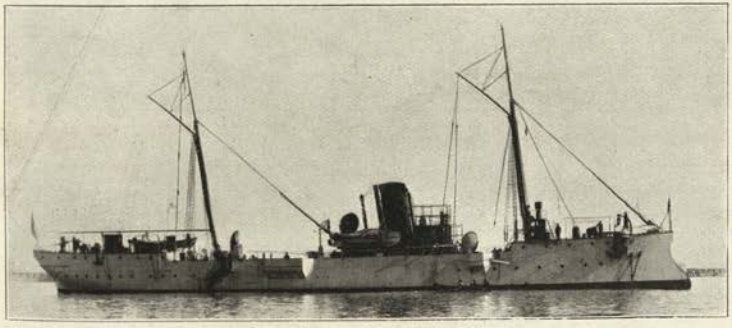
NADIEJDA.

Note that the red of the flag is crimson.



Torpedo boats.

Torpedo Gunboat.



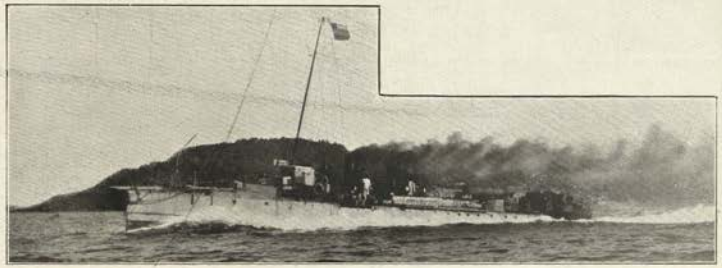
Photo, Geiser.

Guns:
(Schneider-Canet).
2—4 inch.
2—9 pdr.
2—3 pdr.
Torpedo tubes:
2 *above water.*

Armour:
Nil.

NADIEJDA (Bordeaux, 1898). 715 tons. Draught 12½ feet.
Designed H.P. 2600 = 17 kts. (Did 18·85 kts. on trial.) Boilers: Lagrafel d'Allest. (Used as Royal Yacht).

Torpedo Boats.



6 *Creusot* boats (1907). ***Smeli, Khrabry, Drsky, Schumni, Lietiachty, Strogi.*** 98 tons. Armament: 2—3 pdr., 3 -18 inch tubes. Designed H.P. 2000 = 26 kts. 1 Screw. Du Temple boilers.

2 old spar launches. 7 other launches.

Other Ships.

KROUM. 250 tons. H.P. 350 = 8 kts. Paddle wheel. (Used as Royal Yacht.)

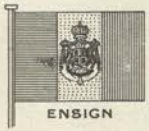
KAMTCHIA. 125 tons. 10 kts.

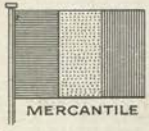
KALIAVRA. 86 tons. 16 kts.

STRIELA. 25 tons. Cutter.

ROUMANIAN NAVY.

Personnel: About 1500.





ELIZABETHA.

Naluca t.b.

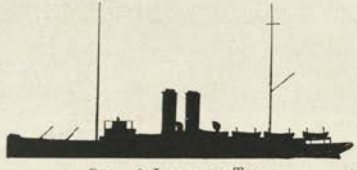
SIRETU'L.

MIRCEA.

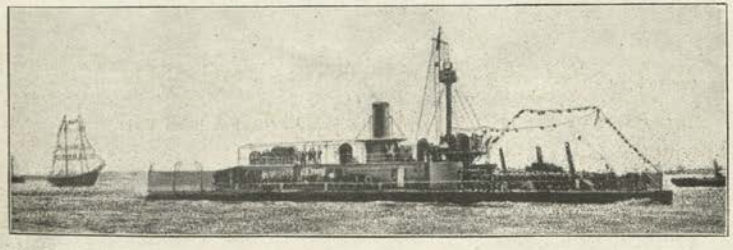
J. BRATIANO.

ALEXANDRU CEL BUN.

ROMANIA.
(18 kt. liner).

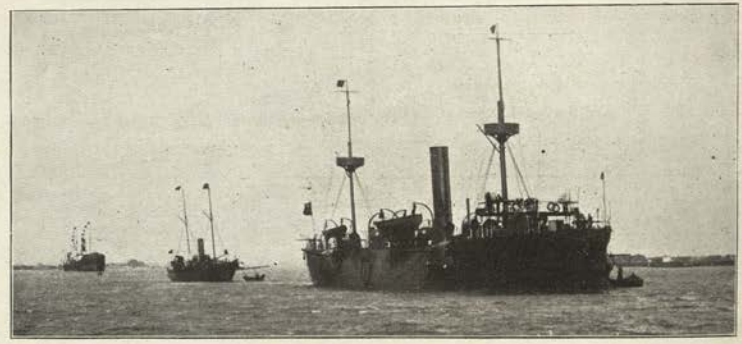

DACIA & IMPERATOR TRAJAN.
(18 kt. liners).

Monitors.



JOAN BRATIANO, MIHAIL COGALNICHEANOU, ALEXANDER LAHOVARI and **LASKAR CATARGI** (—1907). Displacement 600 tons. Complement 80. Guns: 3—4·7 inch, 4—3 pdr., 2—4·7 inch Howitzers. Armour: $2\frac{1}{2}$″ Belt, $2\frac{1}{4}$″ Conning tower, 3″—2″ Turrets. Speed: 14 kts. Built by Stabilimento Tecnico, Triest.

Cruiser.

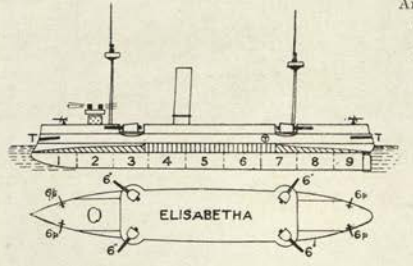


ELIZABETHA (Elswick, 1887) (1907).

1320 tons. Complement 250.

Guns:
4—6 inch
4—6 pdr.
2—1 pdr.
Torpedo tubes (14 inch):
4 *above water*

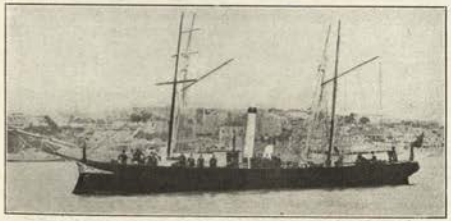
Armour (Steel):
$3\frac{1}{2}$″ Deck (amidships) = *d*
$1\frac{1}{2}$″ Deck (ends) ... .. = *e*
Protection to vitals... = *d*



Designed H.P. 4700 = 18·5 kts. Coal: *normal* 80 tons; *max.* 320 tons.

ROUMANIAN MISCELLANEOUS.

Coastguard Cruisers.



BISISTRA, OTUL, SIRETUL (— 1888). 100 tons. Guns: 1—6 pdr., 2—1 pdr. Speed: 13 kts.

1 funnel.

GRAVITZA' (1880). 110 tons. Armament: 2—6 pdr., 1—1 pdr. Speed: 8 kts.

Training Ships.

ALEXANDRU CEL BUN (1882). 104 tons. Guns: 1 machine. 2—14 inch torpedo tubes. Speed: 9 kts.

MIRCEA (1882). 360 tons. Guns: 2—14 pdr., 2—1 pdr. Speed: about 6 kts.

Small Craft.

OPANEZ, RAHOVA, SMARDAN (1882). 45 tons. 1—1 pdr. Speed: 9 kts.

PRUTUI (1893). 27 tons. Speed: 10 kts.

Destroyers.

4 (Pattison, Naples) (*building*) of 1,400 tons. 40,000 h.p. = 35 kts. Tosi turbines. Armament: 3—4 inch, 7—12 pdr., 2 tubes.

Torpedo Boats.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T tubes	*Max.* draug't
			tons		kts.	tons			feet
3	*Naluca* (F)	1888	56	500	21	12		25	7

(F) = Forges et Chantiers de la Medit. (S) = Schichau.

Note.—Also 16 launches, dropping gear or spar torpedoes.

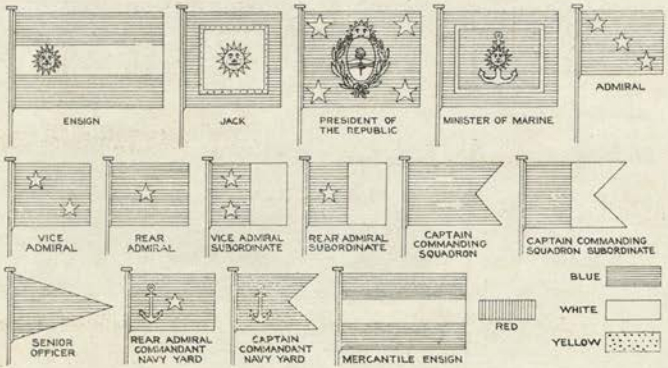
3 *Naluca* class. ***Naluca, Shorul, Smeul*** (reconstructed). Armament: 1—1 pdr. 2 tubes. (Rebuilt 1907.)

Note.—The Ensign, Jack and Mercantile blue is *sky blue*, not ordinary flag blue.

ARGENTINE FLEET.

Photographs also official.

Officially revised, 1913, by order of the Minister of Marine.



Notation	Nominal Calibre.		Maker.	Length in Calibres.	Muzzle Velocity.	Weight A.P. Projectile.	*Max.* penetration against K.C. with capped A.P. at		Danger Space against average warship, at			*Service* Rounds per minute.
							5000 yards.	3000 yards.	10,000 yards.	5000 yards.	3000 yards.	
	inches.	c/m.		calibres.	ft. secs.	lbs.	inches.	inches.				
A[6]	12	*30·5*	B	50	2900	870	19	23				
A	10	*25·4*	E	40	2207	500	7	9½				·6
C	9·4	*24*	K	35	2300	350	4¼	6				·4
A	8	*20·3*	E	45	2660	210	6½	9				1
B	8	*21*	E	40	2286	210	4	6				
E	8	*20*	K	35	2120	200	3	5				
D	6	*15*	B	50	2900	105		8¼				
D	6	*15*	C	50	2750	88	4	6	74	240	465	5
E°	6	*15*		45	2500	100	3	4½	66	210	435	
F°	6	*15*		40	2200	100	3	3¾	37	150	360	
F°	4·7	*12*	C	50	2756	46·3	...	3½				
F°	4·7	*12*	E	45	2570	45	...	2¾				
F°	4·7	*12*	E	40	2150	45	...	...				

° = Brass cartridge case used.

In the Maker's column B = Bethlehem; E = Elswick; K = Krupp; C = Canet; V = Vickers.

Arsenals.

(1) **BUENOS AIRES.** Dry docks: (Eastern) 623 × 65½ × 25 feet, and (Western) 525 × 65½ × 25 feet.

(2) **PUERTO BELGRANO.** Dry docks: (1) 706 × 85 × 32¾ feet, (2) a still larger building.

General Notes.

Mercantile Marine: 269 steamers of about 91,500 tons net. 749 sailing vessels 148,302 tons net.

Personnel: about 8000 all ranks. *Reserve*: about 6000. *Special reserve*: 5500.

F Libertad *class*.

H Patagonia.

K Almirante Brown.

L Rosario & Parana.

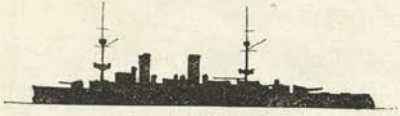
M Presidente-Sarmiento.

N Belgrano.

O Pueyrredon.

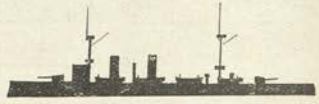
P Garibaldi.

Q San Martin.



R Buenos Aires.

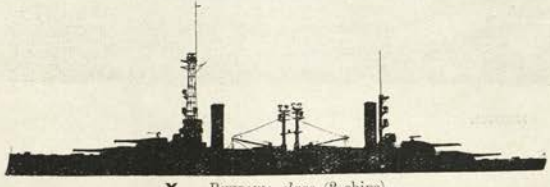
S 9 de Julio.



T 25 de Maio.

U Patria.

V Espora.



X Rividavia *class* (2 ships).

TORPEDO CRAFT. **ET** cone.

H Yarrow t.b.

K Thornycroft t.b.

P Old Yarrow destroyers.

Q Brosse & Fouché t.b.d.

R Schichau t.b.d.

S Krupp t.b.d.

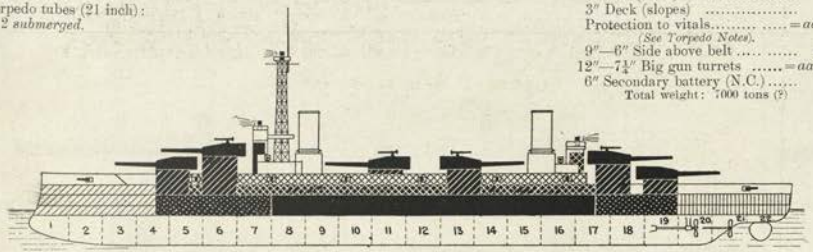
RIVIDAVIA (Aug., 1911), & **MORENO** (Sept., 1911).

Normal displacement, 28,000 tons. *Full load*, 30,000 tons. Complement, 1050.

Length (*p.p.*), 557¾ feet. Beam, 95½ feet. Draught, 27¾ feet. Length *over all*, 580 feet.

Guns:
12—12 inch, 50 cal. (A^6)
12—6 inch
16—4 inch
Torpedo tubes (21 inch):
2 *submerged*.

Armour (Krupp):
12″ Belt (amidships) ..... *aaaa*
5″ Belt (bow) N.C..... *b*
4″ Belt (stern) N.C. ..... *d*
3″ Deck (slopes) .....
Protection to vitals..... .....=*aaaaa*
(*See Torpedo Notes*).
9″—6″ Side above belt .... *aa-a*
12″—7¼″ Big gun turrets .....=*aaaa-a*
6″ Secondary battery (N.C.)..... *b*
Total weight: 7000 tons (?)



Ahead:
8—12 in.
2—6 in.

Astern:
8—12 in.
2—6 in.

Broadside: 12—12in., 6—6 in.

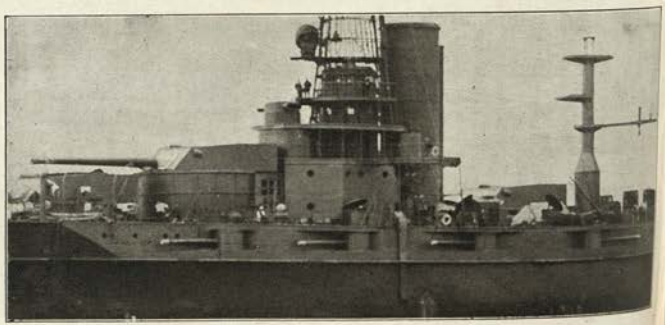
Machinery: Turbine. Designed H.P. 39,500=22·5 kts. Boilers: Babcock. Coal capacity: *normal*, 1600 tons; *maximum*, 4000 tons. Oil: 660 tons. *Nominal* radius: 7000 miles at 15 kts., or 11,000 at 11 kts.

Armour Notes.—The thick part of the belt is 250 feet long, and 9½ feet wide, 5 feet of it below water. Its lowest strake is 10″.

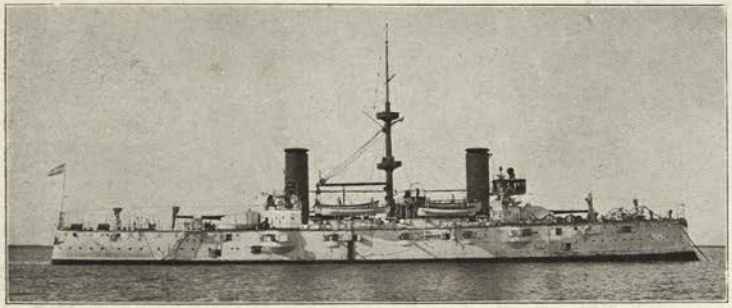
Torpedo Notes.—Bullivant net defence. 12—38″ searchlights. Electric installation at 115 volts. Defence (internal) against torpedoes is a 2″ wall and a 1½″ special deck amidships over the double bottom.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Rividavia	Fore River Co.	Fore River Co.	1910	1914	=	Babcock	
Moreno	N.Y. Ship-building		1910	1914	=	Babcock	

RIVIDAVIA. *Photo, Muller.*



RIVIDAVIA. Details.



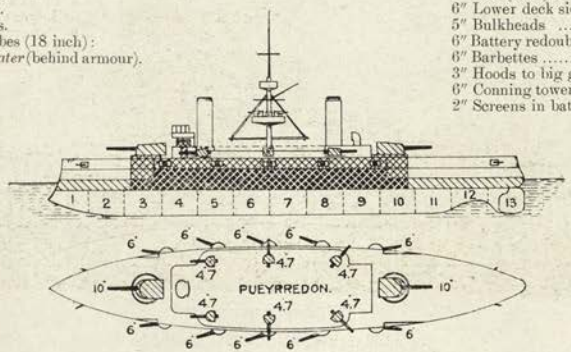
PUEYRREDON (Sept., 1897).

Normal displacement, 6773 tons. Complement, 500.

Length, 328 feet. Beam, 59½ feet. *Maximum* draught, 25 feet.

Guns (Elswick):
2—10 inch, 40 cal. (*A*).
10—6 inch, 40 cal.
6—4·7 inch, 40 cal.
10—6 pdr.
12—1 pdr.
2 Maxims.
Torpedo tubes (18 inch):
4 *above water* (behind armour).

Armour (Terni):
6″ Belt (amidships) ..... *a*
1½″ Deck (flat on it)..... *a*
Protection to vitals is ... *e*
3″ Belt (ends) ..... *a*
6″ Lower deck side ..... *b*
5″ Bulkheads ..... *b*
6″ Battery redoubt (N.C.) *b*
6″ Barbettes ..... *e*
3″ Hoods to big guns ... *b*
6″ Conning tower..... *b*
2″ Screens in battery ...

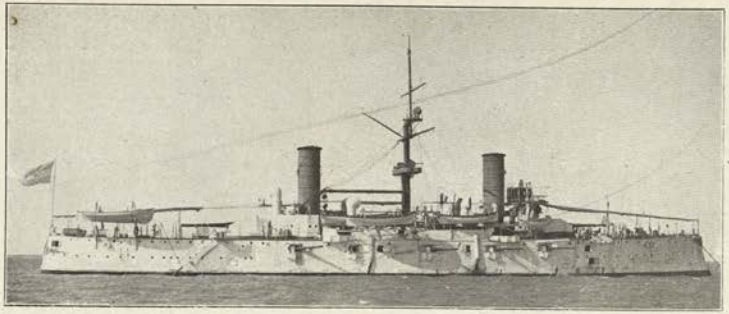


Ahead:
1—10 in.
2—6 in.
2—4·7 in.

Astern:
1—10 in.
2—6 in.
2—4·7 in.

Broadside: 2—10 in., 5—6 in., 3—4.7.

Machinery: 2 sets triple expansion. 2 screws. Boilers: Belleville. Designed H.P. 13000=20 kts. Coal: *normal* 400 tons; *maximum* 1000 tons.



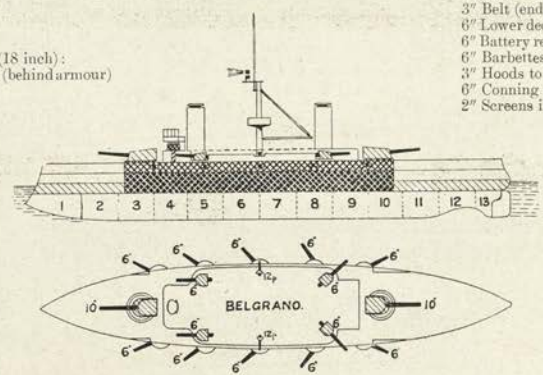
GENERAL BELGRANO (July, 1897).

Normal displacement, 7069 tons. Complement, 500.

Length, 328 feet. Beam, 59½ feet. *Maximum* draught, 26 feet.

Guns (Elswick):
2—10 inch, 40 cal. (*A*)
14—6 inch, 40 cal.
2—12 pdr.
10—6 pdr.
12—1 pdr.
2 Maxims
Torpedo tubes (18 inch):
4 *above water* (behind armour)

Armour (Krupp):
6″ Belt (amidships) ..... *a*
1½″ Deck (flat on it)..... *a*
Protection to vitals is ... *a*
3″ Belt (ends) ..... *e*
6″ Lower deck redoubt... *a*
6″ Battery redoubt (N.C.) *b*
6″ Barbettes ..... *b*
3″ Hoods to big guns ... *e*
6″ Conning tower ..... *b*
2″ Screens in battery ...



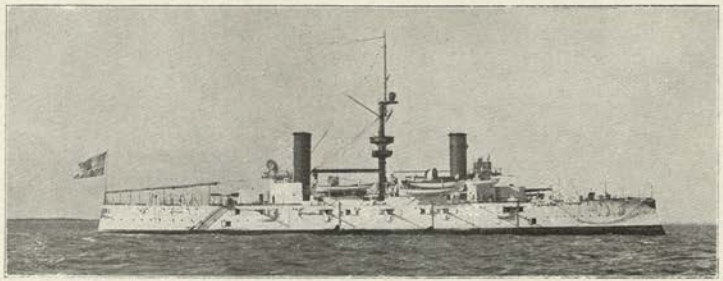
Ahead:
1—10 in.
4—6 in.

Astern:
1—10 in.
4—6 in.

Broadside: 2—10 in., 7—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 8 cylindrical, with 36 furnaces. Designed H.P. 13,000=20 kts. Coal: *normal* 400 tons; *maximum* 1000 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*First trials*	*Boilers*	*Best recent speed*
Belgrano	Orlando	Hawthorn-G.	June,'96	1899		13,391=20·10	Cylindrical	16·3
Pueyrredon	Ansaldo	Ans-Maudslay	Aug.,'96	1901		13,885=19·94	Belleville	17·8

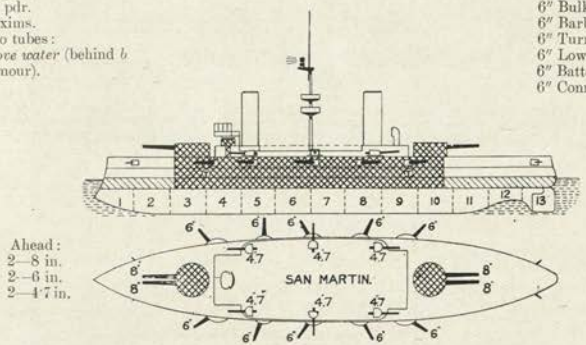


SAN MARTIN (1896).

Normal displacement, 6773 tons. Complement, 500.
Length, 328 feet. Beam, 59½ feet. *Maximum* draught, 25 feet.

Guns (Elswick):
4—8 inch, 40 cal. (*B*).
10—6 inch, 40 cal.
6—4·7 inch, 40 cal.
12—6 pdr.
10—1 pdr.
2 Maxims.
Torpedo tubes:
4 *above water* (behind *b* armour).

Armour (Harvey Nickel):
6″ Belt (amidships) ... *b*
2″ Deck (flat on it) ...
Protection to vitals is *b*
3″ Belt (ends) ..... *c*
6″ Bulkheads ..... *b*
6″ Barbettes ..... *b*
6″ Turrets ..... *b*
6″ Lower deck ..... *b*
6″ Battery ..... *b*
6″ Conning tower..... *b*



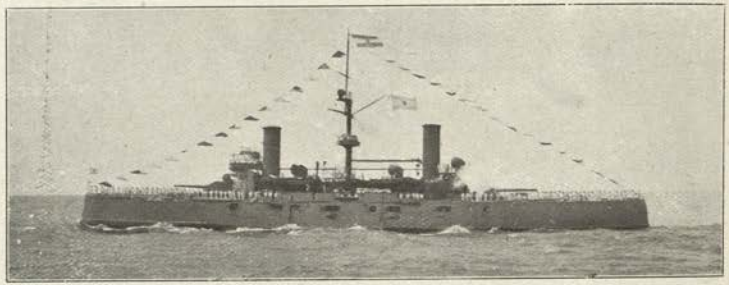
Ahead:
2—8 in.
2—6 in.
2—4·7 in.

Astern:
2—8 in.
2—6 in.
2—4·7 in.

Broadside: 4—8 in., 5—6 in., 3—4·7 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 8 cylindrical, 32 furnaces. Designed H.P. *natural* 8600=18·5 kts.; *forced* 13,000=20 kts. Coal: *normal* 400 tons; *maximum* 1000 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Last refit*	*First Trials*	*Boilers*	*Best recent speed*
Garibaldi	Ansaldo	Ans., Maudslay	1894	1896	1903	13,384=19·9	Cylindrical	14
San Martin	Orlando	Hawthorn, G.	1895	1898		13,000=19·8	Cylindrical	

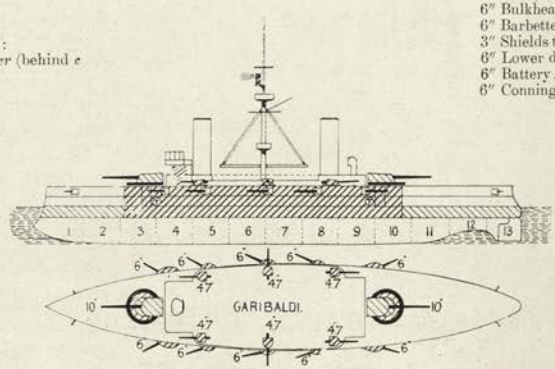


GARIBALDI (1895).

Normal displacement, 6732 tons. Complement, 500.
Length, 328 feet. Beam, 59½ feet. *Maximum* draught, 25 feet.

Guns (Elswick):
2—10 inch, 40 cal. (*A*).
10—6 inch, 40 cal.
6—4·7 inch, 40 cal.
10—6 pdr.
10—1 pdr.
2 Maxims.
Torpedo tubes:
4 *above water* (behind *c* armour).

Armour (Harvey):
6″ Belt (amidships) ... *c*
2″ Deck (flat on it) ...
Protection to vitals is *c*
3″ Belt (ends) ..... *c*
6″ Bulkheads ..... *c*
6″ Barbettes ..... *c*
3″ Shields to 10 in. guns *c*
6″ Lower deck ..... *c*
6″ Battery ..... *c*
6″ Conning tower..... *c*



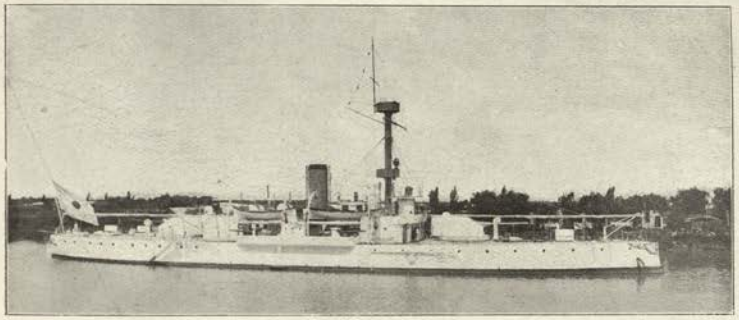
Ahead:
1—10 in.
2—6 in.,
2—4·7 in.

Astern:
1—10 in.
2—6 in.,
2—4·7 in.

Broadside: 2—10 in., 5—6 in., 3—4·7 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 8 cylindrical, 32 furnaces. Designed H.P. *natural* 8600=18·5 kts.; *forced* 13,000=20 kts. Coal: *normal* 400 tons; *maximum* 1000 tons.

General Notes.—*Garibaldi* built by Ansaldo, *San Martin* by Orlando. Both built originally for the Italian Navy and purchased by Argentina for about £750,000 per ship.



INDEPENDENCIA.

INDEPENDENCIA (1891), & LIBERTAD (1890).

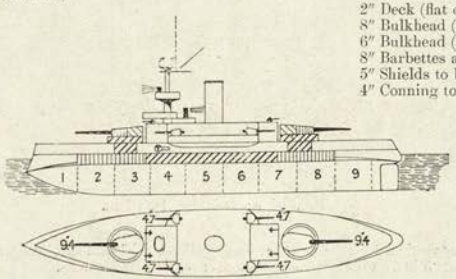
Displacement, 2336 tons. Complement, 225.

Length 230 feet. Beam, 44½ feet. *Mean* draught, 13 feet.

Guns:
2—9·4 inch, 35 cal. (Krupp) (*C*).
4—4·7 inch, 40 cal. (Elswick).
4—3 pdr.
2—1 pdr.

Torpedo tubes:
2 *above water*

Armour (compound):
8″ Belt (amidships) ..... *c*
Protection to vitals..... *c*
2″ Deck (flat on belt)..... *c*
8″ Bulkhead (forward) ..... *c*
6″ Bulkhead (aft) ..... *d*
8″ Barbettes and bases ..... *c*
5″ Shields to big guns (fronts) *d*
4″ Conning tower ..... *c*

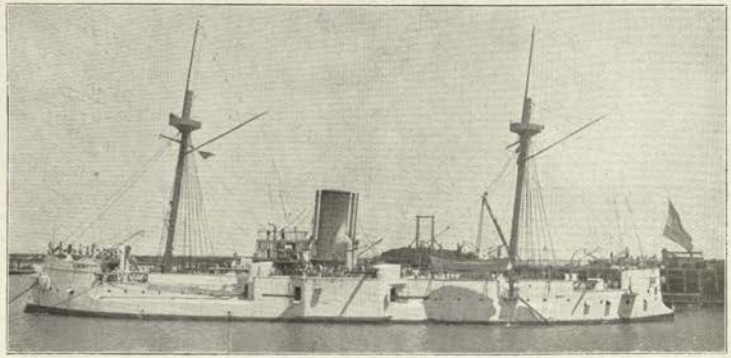


Ahead:
1—9·4 in.
2—4·7 in.

Astern:
1—9·4 in.
2—4·7 in.

Machinery: Compound vertical. 2 screws. Boilers: 4 double cylindrical. Designed H.P. *natural draught* 2100 = 13·2 kts.; *forced* 2780 = 14·2 kts. (made on *trial*.) Coal: *normal* 230 tons; *maximum* 340 tons.

Notes.—Built at Laird's, Birkenhead. Belt 172 feet long.



ALMIRANTE BROWN (1880).

Reconstructed at La Seyne, 1897.

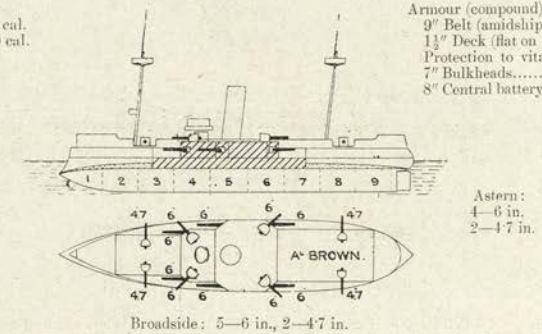
Displacement, 4267. Complement, 380.

Length, 240 feet. Beam 50 feet. *Maximum* draught, 22 feet.

Guns (Canet):
10—6 inch, 50 cal.
4—4·7 inch, 50 cal.
8— 3 pdr.

Torpedo tubes:
Nil

Armour (compound):
9″ Belt (amidships)..... *c*
1½″ Deck (flat on belt).
Protection to vitals... = *c*
7″ Bulkheads..... *c*
8″ Central battery..... *c*



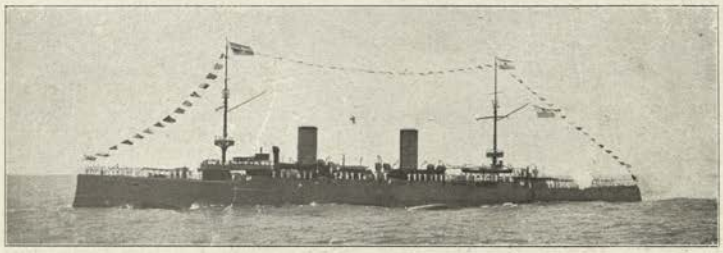
Ahead:
4—6 in.
2—4·7 in.

Astern:
4—6 in.
2—4·7 in.

Broadside: 5—6 in., 2—4·7 in.

Machinery: vertical compound. 2 screws. Boilers: cylindrical (new recently). Designed H.P. 4500 = 14 kts.; speed, 11 kts. Coal: *maximum* 650 tons.

Note.—Built by Samuda, of London.



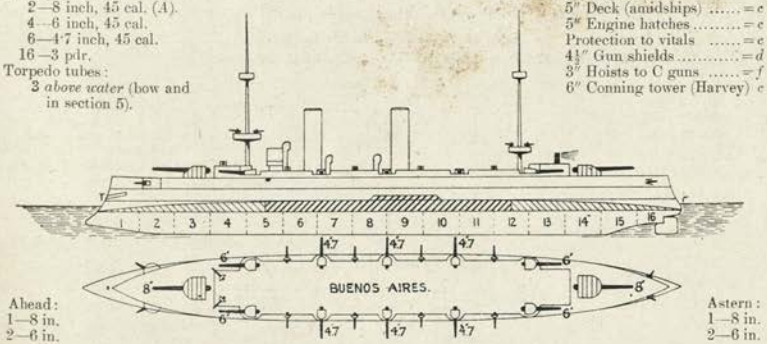
BUENOS AIRES (1895).

Displacement 4500 tons. Sheathed and coppered. Complement 400.

Length (*waterline*), 408 feet. Beam, 47⅛ feet. *Maximum* draught, 22 feet. Length *over all*, 424 feet.

Guns (Elswick):
2—8 inch, 45 cal. (*A*).
4—6 inch, 45 cal.
6—4·7 inch, 45 cal.
16—3 pdr.
Torpedo tubes:
3 *above water* (bow and in section 5).

Armour (steel):
5″ Deck (amidships) ..... = *c*
5″ Engine hatches ..... = *c*
Protection to vitals ..... = *c*
4½″ Gun shields ..... = *d*
3″ Hoists to C guns ..... = *f*
6″ Conning tower (Harvey) *c*



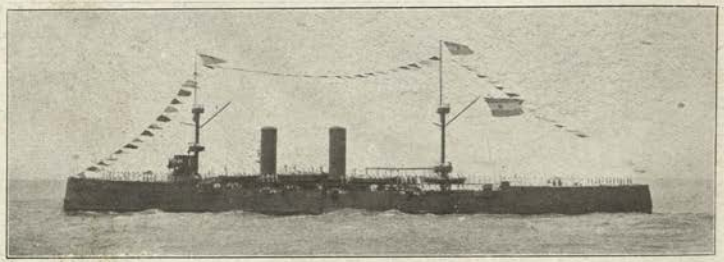
Ahead:
1—8 in.
2—6 in.

Astern:
1—8 in.
2—6 in.

Broadside: 2—8 in., 2—6 in., 3—4·7 in.

Machinery: 4 sets 3 stage compound direct acting. 2 screws. Boilers: return tubes, 8—2-ended and 8 1-ended. Designed H.P. 13,000 = 23 kts.; 17,000 = 24 kts. Coal: *normal* 400 tons; *maximum* 1000 tons.

Engineering Notes.—On first *trials*: 6 hours *natural* 13,000 = 23·2 kts.; *forced* 18,000, exceeded 24 kts. Present speed, nearly 24 kts. *General Notes.*—Built and designed at Elswick.



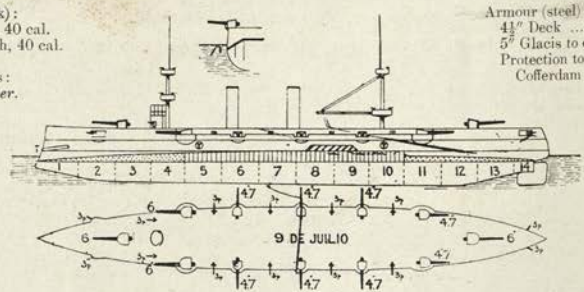
9 DE JULIO (1892).

Displacement 3500. Complement 320.

Length, 350 feet. Beam, 44 feet. *Mean* draught, 19½ feet.

Guns (Elswick):
4—6 inch, 40 cal.
8—4·7 inch, 40 cal.
12—3 pdr.
Torpedo tubes:
5 *above water*.

Armour (steel):
4½″ Deck ..... = *d*
5″ Glacis to engines... = *e*
Protection to vitals ... = *e*
Cofferdam amidships.



Ahead:
3—6 in.

Astern:
1—6 in.
3—4·7 in.

Broadside: 3—6 in., 4—4·7 in.

Machinery: 2 sets vertical 4 cylinder. 2 screws. Boilers: 8—2-ended. Designed H.P. *natural* 2500 = 21 kts.; *forced* 14,500 = 22·5 kts. Coal: *normal* 300 tons; *maximum* 770 tons.

Engineering Notes.—She reached 22·74 kts. on her first *trial*. Present speed, about 22 kts.

General Notes.—Built and designed at Elswick. This ship has no double bottom, amidships.

25 DE MAIO (1890).

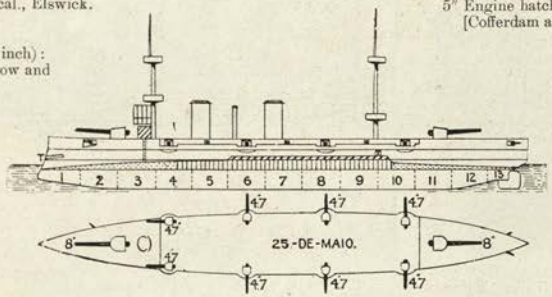
Displacement 3200 tons. Complement 300.

Length, 330 feet. Beam, 43 feet. *Mean* draught, 16½ feet.

Guns (Elswick):
2—8·2 inch, old Krupp (*D*).
8—4·7 inch, 40 cal., Elswick.
12—3 pdr.
12—1 pdr.

Torpedo tubes (18 inch):
3 *above water* (bow and broadside).

Armour (steel):
4½″ Deck.....=*d*
5″ Engine hatches.....=*c*
[Cofferdam amidships].



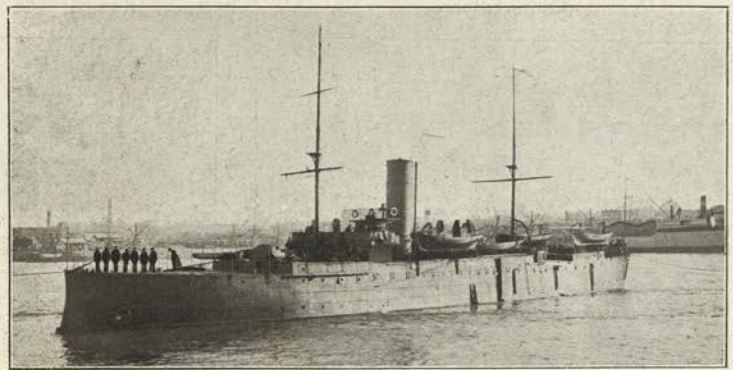
Ahead:
1—8 in.
2—4·7 in.

Astern:
1—8 in.
2—4·7 in.

Broadside: 2—8 in., 4—4·7 in.

Machinery: 2 sets vertical 4 cylinder. 2 screws. Boilers: cylindrical, 4—2-ended. Designed H.P., *natural* 8500=21 kts.; *forced* 13,000=22 kts. Coal: *normal* 300 tons; *maximum* 600 tons.

General Note.—Built and designed at Elswick.



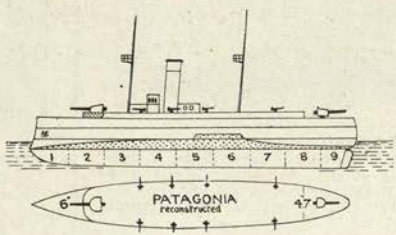
PATAGONIA (1885). (1909 reconstructed).

Displacement 1442 tons. Complement 210.

Guns (Elswick):
1—6 inch
1—4·7 inch
8—3 pdr.

Torpedo tubes:
None.

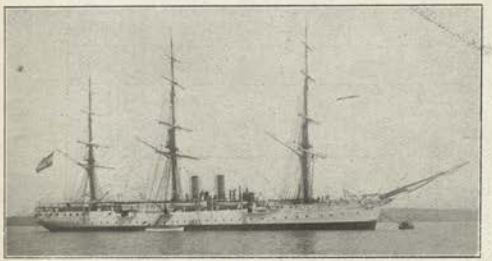
Armour (steel):
1½″ Deck ... .=



Machinery: 2 sets horizontal compound. 2 screws. Boilers: cylindrical. Designed H.P. 2400=14 kts. Coal: *normal* 200 tons; *maximum* 350 tons.

Built at Triest.

Unprotected Cruisers.

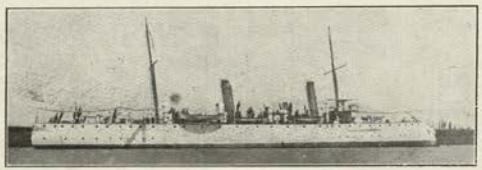


PRESIDENTE-SARMIENTO (1897). Training ship. Built at Birkenhead. 2750 tons. Guns: 5—4·7 inch, 50 cal.; 2—14 pdr., 2—6 pdr., 4—3 pdr. Torpedo tubes: 2 *above water* (bow and stern). Designed H.P. 2200=13·5 kts. Niclausse boilers.

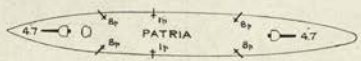
Armoured Gunboats.

PARANA (April, 1908) & **ROSARIO** (July, 1908). Displacement, 709 tons. Complement, 167. Length, 250 feet. Beam, 32 feet. Draught, 14 feet. Guns: 2—6 inch Howitzers, 6—12 pdr., 8 Machine. Armour: 4″ Belt (amidships), 1½″—1″ Deck, 3″ Conning tower. H.P. 2,000=17 kts. Coal: 117 tons. Nominal radius, 2,400 miles at 10½ kts.

Torpedo Gunboats.



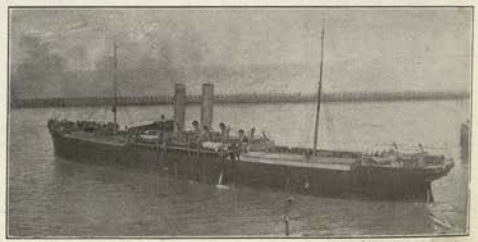
PATRIA (1893). Displacement, 1070 tons. Complement, 100. Guns: 2—4·7 inch, 40 cal., 4—8 pdr., 2—1 pdr. Torpedo tubes (18 inch): 5 *above water*. Machinery: 2 sets triple expansion. 2 screws. Boilers: 4 locomotive. Designed H.P. *natural* 3300=17·5 kts.; *forced* 5000=20·5 kts. Coal: 288 tons. Built at Laird's, Birkenhead.



ESPORA (1890). (Reconstructed 1905). Displacement, 550 tons. Complement, 124. Guns: 2—3 inch, 14 pdr., 5—3 pdr. Torpedo tubes: 1 *above water* (bow). Armour (steel): *Nil*. Machinery: 2 sets triple expansion. 2 screws. Boilers: 6 Yarrow. Designed H.P. *forced* 3000=19·5 kts. Coal: *normal* 100 tons; *maximum* 130 tons. Built at Laird's, Birkenhead. Reconstructed 1905.

Other Ships.

One sloop, *Uruguay*.
Two transports, *Pampa & Chaco*, 6,000 tons.
One „ *Guardia Nacional*, 4,500 tons.
One „ *10 de Maio*, 500 tons.
(and *several smaller ones*).



PAMPA.

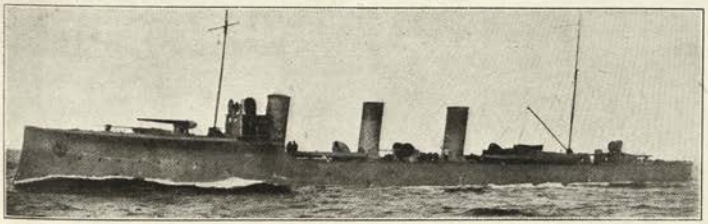
11+4 *pro.* Destroyers.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			feet
4	*Santiago* (K)	'13-'15	1"00	30,000	32	345 oil (only)	...	8	...
2	*Cordoba* (S)	'10-'12	1100	20,000	34	{ 280 coal +	110	4	10
2	*Catamarca* (K)	'10-'12	1100	20,000	34	{ 51·6 oil	110	4	10
4	*Mendoza* (B)	'10-'13	950	18,000	32	256 coal + 80 oil	...	4	10¼
3	*Corrientes* (Y)	'96-'08	250	4200	27	80	54	3	7½

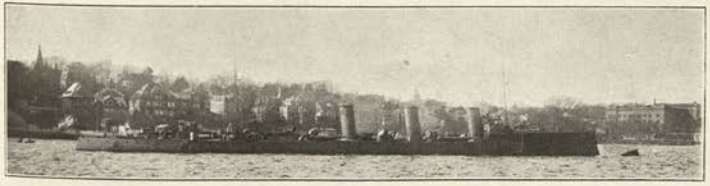
B = Chantiers de Bretagne. K = Krupp. S = Schichau. Y = Yarrow

Building.

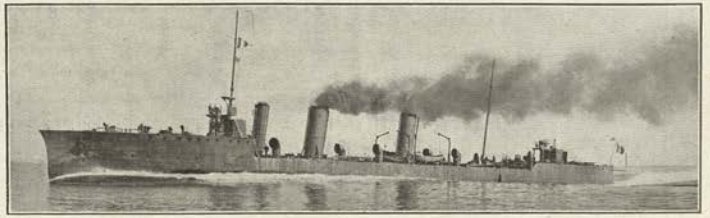
4 *Krupp.* ***San Luis, Santa Fé, Santiago, Tucuman*** *(building).* 1250/1450 tons. Armament: 3—4 inch (Beth.), 8—21 inch tubes (in pairs). Designed H.P. 30,000 = 32 kts. Fuel (oil only): 345 tons.



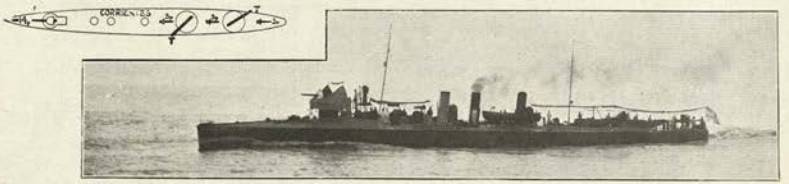
2 *Schichau.* ***Cordoba, La Plata*** (1911). 890 tons. 295 × 29½ × 10 feet. Armament: 4 - 4 inch (Beth.), 4—21 inch tubes. Curtiss (A.E.G.) turbines. Designed H.P. 20,000 = 34 kts. Coal: 280 tons. Oil: 51·6 tons. Trials (*max.*): *Cordoba*, 34·7; *La Plata*, 36·8.



2 *Krupp.* ***Catamarca*** & ***Jujuy*** (1911). 1100 tons. 288½ × 27 × 10 feet. Armament: 4—4 inch (Beth.), 4—21 inch tubes. Curtiss (A.E.G.) turbines. Designed H.P. 20,000 = 34 kts. Coal: 280 tons. Oil: 51·6 tons.



4 *Ch. de Bretagne.* ***Mendoza, Rioja, Salta, San Juan*** (—, 1911). 950 tons. 289½ × 28½ × 10½ feet. Armament: 4—4 inch (Beth.), 4—21 inch tubes. 2 searchlights. Rateau turbines. H.P. 18,000 = 32 kts. Coal: 256 tons. Oil: 80 tons. On trial *Mendoza* did 32·98 (average).



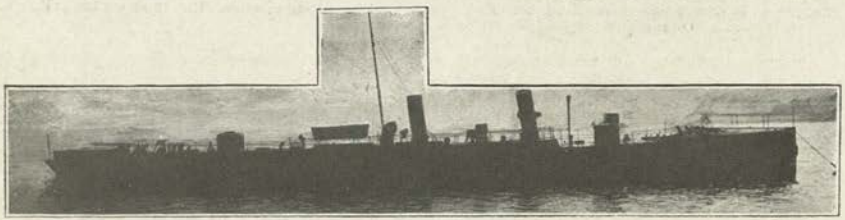
3 *Corrientes* class ***Corrientes, Entre-Rios, Misiones*** (—1896). 1" armour protection amidships. Armament: 1—14 pdr., 3—6 pdr., 3 tubes (18 inch). Yarrow boilers. Coal: 80 tons. *Max.* radius 2500 miles

8 Torpedo Boats.

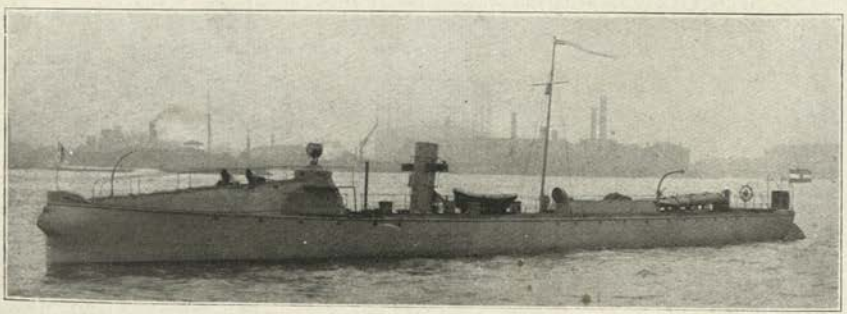
No.	Type	Date	Dis-placement	H.P.	*Max.* speed	Fuel	Com-plement	T. tubes	*Max.* draug't
			tons		kts.	tons			feet
12	*New*	*pro.*	*200*						
2	*Commodoro Py* (T)	'90-'91	110	1500	24·5	22	27	3	6½
6	*Bathurst* (Y)	'90-'91	85	1200	24	15	15	2	6

T = Thornycroft. Y = Yarrow.

There are also 8 or 10 launches of 16 tons (T) and (Y) built 1890-91 with one tube each. *Max.* speed 17 kts



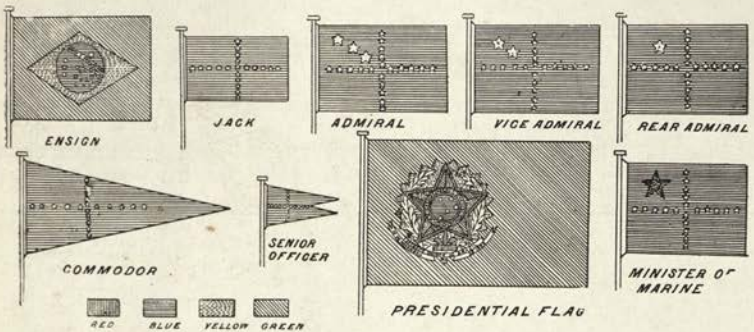
2 *Commodoro Py.* **Commodoro Py** and **Muratore.** Armament: 3–3 pdr., 3–18 inch tubes. Thornycroft boilers. *Max.* draught 6 feet.



6 *Bathurst* class. **Bathurst, Buchardo, Jorge, King, Pinedo, Thorne.** Armament: 2–3 pdr., 2–14 inch tubes. Locomotive boilers. *Max.* draught 6 feet.

BRAZILIAN FLEET.

(Officially revised, 1911, by order of the Minister of Marine.)



Mercantile Marine.

317 steamers, 137,902 tons net.
79 sailing, 20,705 „ „

Guns in Service.

Notation.	Calibre.		Length in calibres	Weight of A.P. shell.	Muzzle Velocity.	Max. penetration A.P. capped at K.C. at 5000 yards.	Max. penetration A.P. capped at K.C. at 3000 yards.	Danger Space against average ships at 10,000 yards.	Danger Space against average ships at 5000 yards.	Danger Space against average ships at 3000 yards.	Service rounds per minute.
	inch.	c.m.	cals.	lbs.	ft. secs.	inch.	inch.				
A^6	12	*30·5*	50	...	...	...	...	...	...	...	...
AA	9·2	*23*	45	380	2700	9	11½	...	...	...	8
AA	9·4	*24*	36	374	2500	8	10¼	...	...	..	...
A	8	*20·3*	45	210	2650	6½	8½	...	...	...	1
D	6	*15*	40	100	2500	4	5	65	200	420	6
D	6	*15*	50	100	2640	4¼	5½	72	240	460	6
F	4·7	*12*	40	45	2150	...	...	...	...	...	8
F	4·7	*12*	50	45	2630	...	...	...	...	...	8

All except the 9·4 which is Schneider-Canet, are Elswick guns.

Almirante is only a war appointment: *Vice-Almirante* is the highest place rank.

Capitao tenente is equivalent to a British two and a half stripe. *1° tenente* a two-striped lieutenant. *2° tenente* = sub-lieutenant. Civilian ranks have the same stripes *without* the curl, and plus colours above top stripe and below bottom one as under:

Constructors.—No colour, but a ball above the stripes.

Engineers (Machinista).—Green.

Doctors (Cirurgiao).—Red.

Paymasters (Commissario).—White.

Shoulder straps for engineers carry a cylinder, for doctors a stethoscope, for paymasters two quill pens crossed. These devices are also worn on the collar of tunic.

Caps.—Admirals have a broad gold band with oak leaf device, the other commissioned ranks narrow gold bands as on sleeves.

Warrant officers and men carry white distinctive sleeve badges, as follows:—*Torpedo*, torpedoes; *gunnery*, two crossed guns; *navigation*, two crossed anchors; *signal*, two crossed flags; *quartermasters*, a wheel; *engine room complements*, a screw propeller.

Marine Infantry—Scarlet tunics with black insignia: five stripes for first sargento, four for second ditto, two for cabo. White helmets as the British. No commissioned officers.

Brazilian sailors enter as boys at about twelve years. They do three years in a school, then ten months special instruction, then serve twelve years with the fleet. Volunteers three to twenty years. There are nineteen schools for boys.

Arsenals.

(1) RIO DE JANEIRO. 5 docks. *Docks* *a* Imperial . 423×70×24 } Government.
b Santa Cruz 258×55×20 }
One floating dock (23,000 ton) 550×130 feet.
and one large graving dock *building*.

(2) Para, (3) Ladario (river).

Personnel about 15,300 all ranks (including 6000 sailors, 3000 stokers, 900 marines and 3000 boys).

BRAZILIAN IDENTIFICATIONS AND SIGNAL SILHOUETTES.

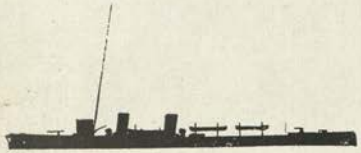
AG Republica

AH Gust. Sampaio.

BQ Deodoro *class*.

BQ Tiradentes.

CG Benj. Constant.



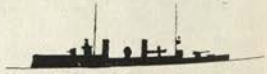
GA Bahia *class* (3 ships).

H Minas Geraes *class* (2 ships).

IG Barroso.

JG Tamandare

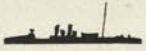
KG Timbira.



KG Tupy & Tamoyo.

TORPEDO CRAFT. **ZT** cone.

G Destroyers.



H Goyaz t.b.

I Silvado *class* t.b.

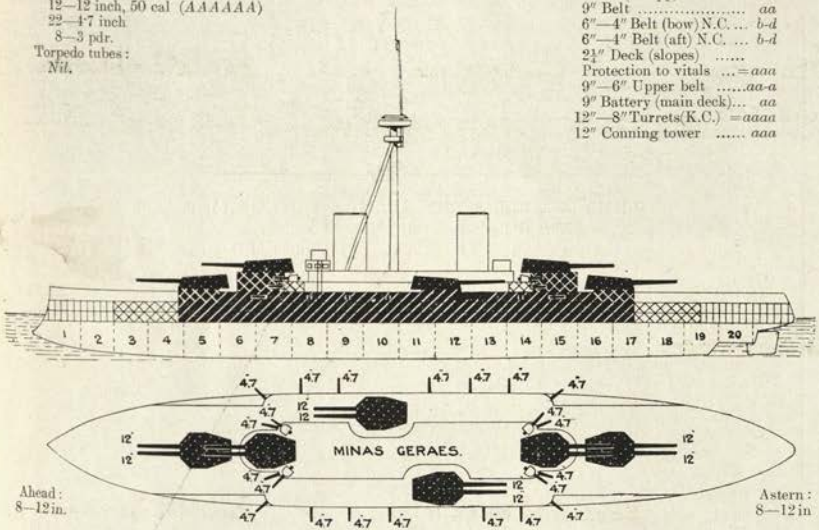
(Minas Geraes Class—2 Ships).

MINAS GERAES (Sept., 1908), **SAO PAULO** (April, 1909).

Normal displacement 19,281 tons. *Full load* 21,200 tons. Complement 900.
Length (*waterline*), 530 feet. Beam 83 feet. *Maximum* draught, 28 feet.

Guns:
12—12 inch, 50 cal (*AAAAAA*)
22—4·7 inch
8—3 pdr.
Torpedo tubes:
Nil.

Armour (Krupp):
9″ Belt ..... *aa*
6″—4″ Belt (bow) N.C. ... *b-d*
6″—4″ Belt (aft) N.C. ... *b-d*
2¼″ Deck (slopes) .....
Protection to vitals ...=*aaa*
9″—6″ Upper belt .....*aa-a*
9″ Battery (main deck)... *aa*
12″—8″Turrets(K.C.) =*aaaa*
12″ Conning tower ..... *aaa*



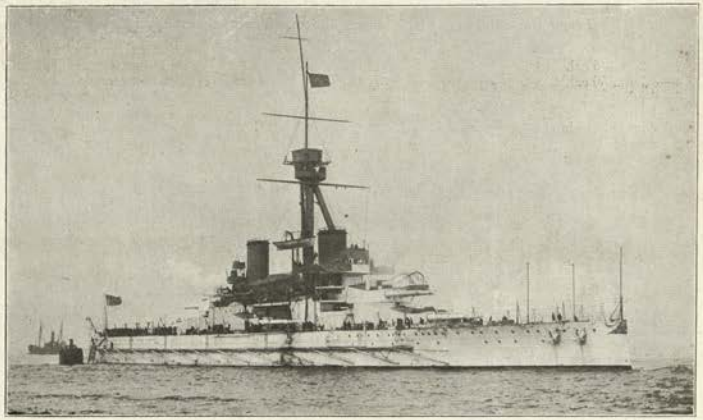
Broadside: 10—12 inch.

Machinery: 2 sets triple expansion. 2 screws. Designed H.P. 23,500 = 21 kts. *f.d.* Boilers: Babcock. Coal: *normal* 800 tons; *maximum* 2350 tons. Plus oil. Nominal radius 10,000 at 10 kts.
Torpedo Notes.—⅓ net defence (Bullivant).
Engineering Notes.—66 revs. = about 10 kts.; 126 = 20 kts.; 148 about 21·5 kts.

Name.	*Builder.*	*Machinery.*	*Laid down.*	*Completed.*	*Trials. 30 hour at ¾*	*Trials. Full power*	*Boilers.*	*Best recent speed.*
M Geraes	Elswick	Vickers	1907	Jan.'10	16,177=19·13	27,212=21·43	Babcock	22·29
S Paulo	Vickers	Vickers	1907	July '10	16,067=19·85	28,645=21·62	Babcock	

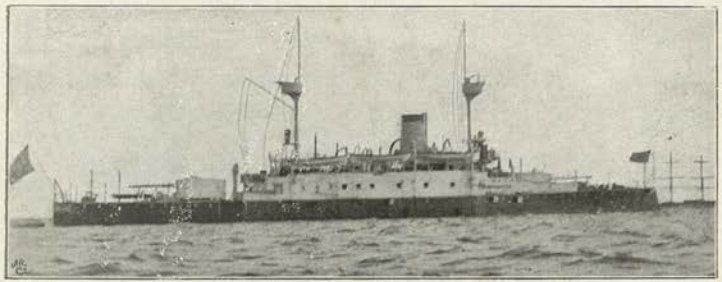
General Notes.—Both ships were somewhat over normal displacement on trials.

Sao Paulo.



M. Geraes.

BRAZILIAN COAST BATTLESHIPS (*Encouraçados*).



Refitting. (Appearance may be altered after refit).

(Deodoro Class—2 Ships.)

DEODORO (1898) & FLORIANO (1899).

Displacement 3162 tons. Complement 200.

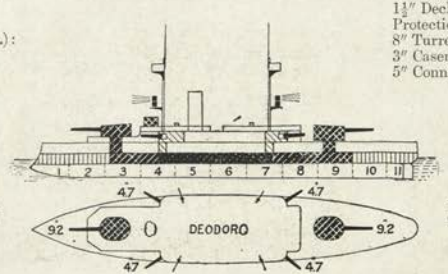
Length (*waterline*), 267½ feet. Beam, 48 feet. *Maximum* draught, 14¼ feet.

Guns:
2—9·2 in., 45 cal. (*AA*).
4—4·7 in., 50 cal.
6—6 pdr.
4—1 pdr.

Torpedo tubes (18 in.):
2 *submerged*.

Armour (Harvey-nickel):

13⅜″ Belt (amidships) ...	*aaa*
4″ Belt (ends)	*d*
1½″ Deck (reinforcing belt).	
Protection to vitals ... =	*aaaa*
8″ Turrets.....	*a*
3″ Casemates	*c*
5″ Conning tower.....	*c*



Ahead: 1—9·2 in., 2—4·7 in.

Astern: 1—9·2 in., 2—4·7 in.

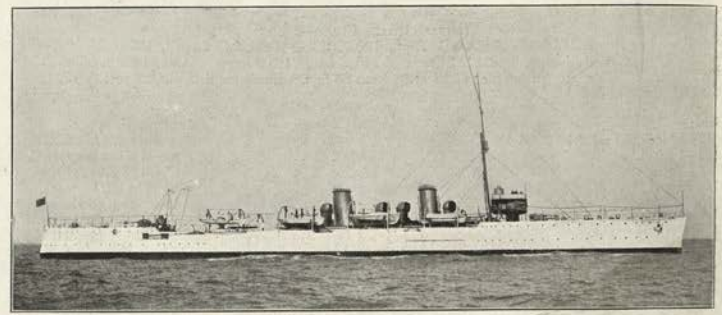
Broadside: 2—9·2 in., 2—4·7 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: (1912), Babcock. Designed H.P. 3400 = 14 kts. Coal: *normal* 246 tons.

Armour Notes.—Lower edge of belt is only 6″ thick.

General Notes.—Designed and built at La Seyne. Laid down 1896-97. Completed 1901-02.

BRAZILIAN CRUISERS (*Cruzadores*).



BAHIA (Jan., 1909) & RIO GRANDE DO SUL (April, 1909).

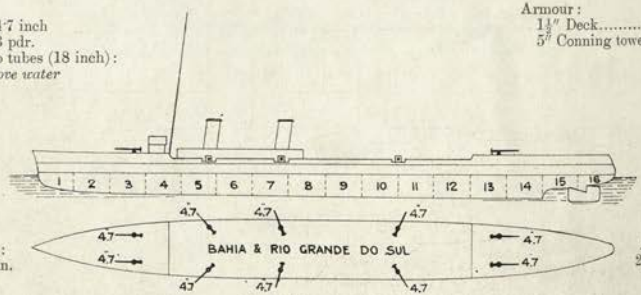
Normal displacement 3100 tons. Complement .

Length, 380 feet. Beam, 39 feet. *Mean* draught, 14½ feet.

Guns:
10—4·7 inch
6—3 pdr.

Torpedo tubes (18 inch):
2 *above water*

Armour:
1½″ Deck.....
5″ Conning tower .....



Ahead: 2—4·7 in.

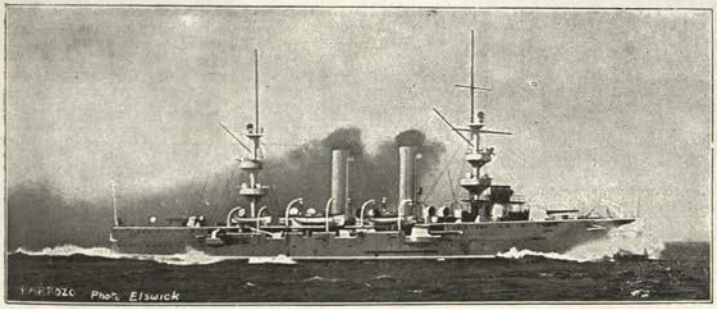
Astern: 2—4·7 in.

Broadside: 5—4·7 inch.

Machinery: Parsons turbine. 3 screws. Boilers: Yarrow. Designed H.P. 18,000 = 26·5 kts. Coal: *normal* 150 tons, *maximum* 500 tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials* 6 hours ½.	*Trials* Full power.	*Boilers*	*Best recent speed*
Bahia	Elswick	Vickers	1908	1910	= 24	20,101 = 27·02	Yarrow	27·02
Rio G. do Sul	Elswick	Vickers	1908	1910	= 24	= 27·41	Yarrow	27·41

BRAZILIAN PROTECTED CRUISERS.

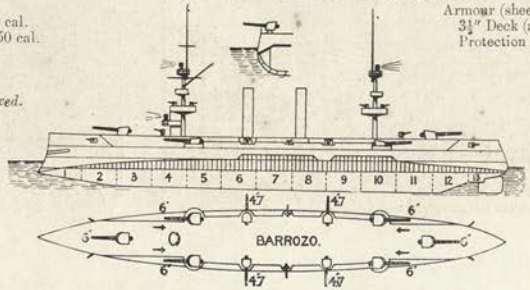


BARROZO (Elswick, 1896).

3450 tons. Comp. 300. Dimensions (*p.p.*): 330 × 43¾ × 20 feet.

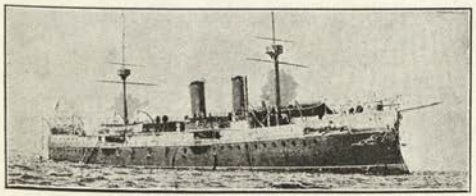
Guns:
6—6 in., 50 cal.
4—4·7 in., 50 cal.
10—6 pdr.
4—1 pdr.
4 Maxims.
Tubes removed.

Armour (sheet):
3½″ Deck (amidships) = *d*
Protection to vitals ... = *c*



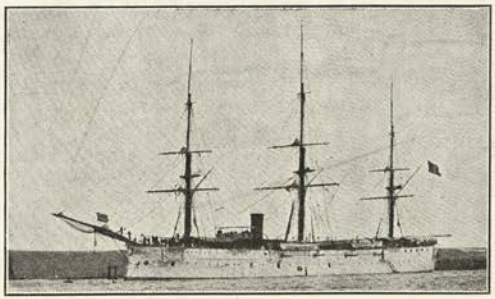
Broadside: 4—6 in., 2—4·7 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. *forced* 7500 = 20 kts. Coal: *normal* 700 tons; *maximum* 850 tons.



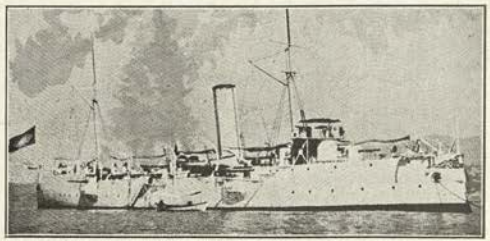
TAMMANDARE (Rio, 1890). 4537 tons. Comp. 450. Guns: 10—6 inch, 2—4·7 inch. Deck 1¾″. Upper deck casemates (4) 3″. C.T. 2″. Designed H.P. 7500 = 17 kts. Horizontal engines. Cyl. boilers. Coal: *maximum* 750 tons.

Training Cruiser.



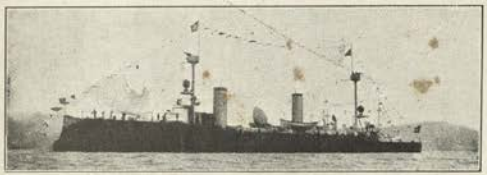
BENJAMIN CONSTANT (La Seyne, 1892). 2750 tons. Comp. 380. Guns (Elswick): 4—6 inch, 45 cal. 8—4·7 inch, 45 cal. 2—12 pdr., 2—1 pdr. Torpedo tubes (14 inch), 4 *above w.* Armour: 2″ deck. Designed H.P. 4000 *f.d.* = 15 kts. Cyl. boilers. Coal: 260 tons.

Mine Ship.

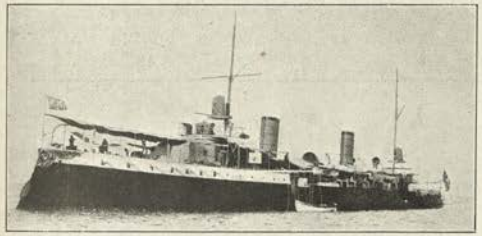


REPUBLICA (Elswick, 1892). 1300 tons. Comp. 165. Guns (Elswick): 6—4·7 inch, 4—6 pdr. Torpedo tubes (14 inch), 3 *above w.* Armour: 2½″ deck. Designed H.P. *f.d.* 3400 = 17·4 kts. Cyl. boilers. Coal: 416 tons.

Torpedo Gunboats.

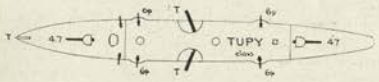


TIMBIRA.

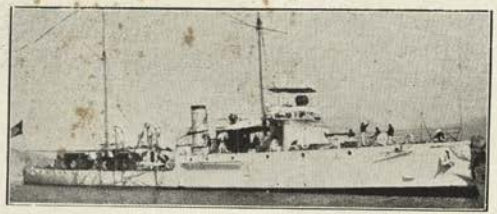


TUPY & TAMOYO.

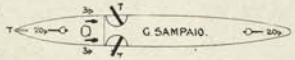
TIMBIRA (1896), **TUPY** (1896) & **TAMOYO** (1896). 1030 tons. Complement 110. Dimensions: 259 × 30 × 10¼ feet. Armament (Krupp): 2—4·7 inch, 6—6 pdr., 4—1 pdr., 3—14 inch tubes. Armour: 1" Deck. Designed H.P. 7000 = 23 kts. Coal: 100 tons. Built by Krupp.

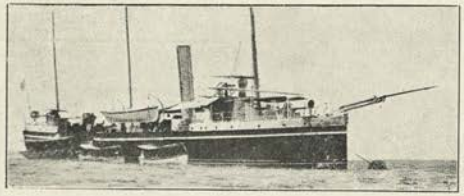


Torpedo Gunboats—(*Continued*).



GUSTAVO SAMPAIO (Elswick, 1896). 500 tons. Complement 95. Guns: 2—3·5 inch (Krupp), 4—3 pdr. 3—14 inch tubes. Designed H.P. 2300 = 18 kts. Coal: 150 tons.





TIRADENTES (Elswick, 1892). 800 tons. Complement 100. Guns: 4—4·7 inch, 2—6 pdr., 5 Nordenfelts. Tubes: 2—14 inch. Designed H.P. 1200 = 14·7 kts. Coal: 140 tons.

River Monitors.

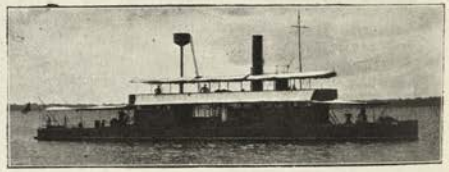
JAVARY, MADEIRA, SOLIMOES (— Vickers, 1913). 1200 tons. Dimensions: 265 × 49 × 8½ feet. Armament: 2—6 inch (forward), 2—4·7 inch Howitzers (aft), 4—3 pdr. Armour: 2" sides. Designed H.P. = 11½ kts. Nominal radius, 4000 miles. Machinery: Triple expan. Boilers: 2 Yarrow. Coal and oil fuel.

River Monitors—(*Continued*).

1 funnel, 1 mast.

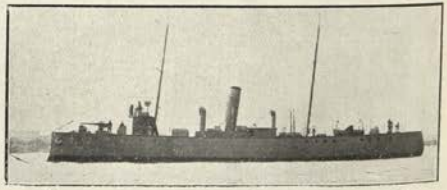
PERNAMBUCO & **MARANHÃO** (1909-10). Built at Rio. 460 tons. Guns: 2—4·7 inch, 4—1 pdr., 3 machine. Armour: 4" waterline, 4" deck, 3½" conning tower, 5" turret.

River Gunboats.



ACRE, AMAPÁ, JURUÁ, MISSOES (Yarrow, 1904). 25 tons. Armament: 1—3·4 inch. howitzer, 2—6 pdr., 7 maxims. Speed: 11 kts.

Customs Cruiser.



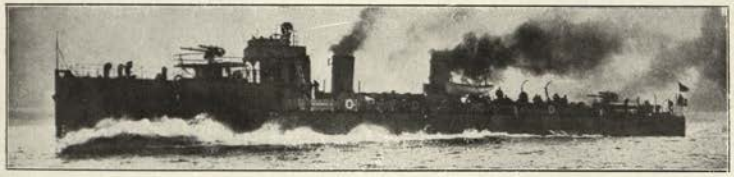
AMAPÁ (Thornycroft, 1907). Guns: 1—6 pdr. Speed: 13 kts.

Transport.

ANDRADA (*ex America, ex Britannia*) (1890). 2600 tons. Guns: 2—4·7 inch, 2—14 pdr. Original speed: 17 kts.

BRAZILIAN TORPEDO CRAFT.

10 + 5 Destroyers.

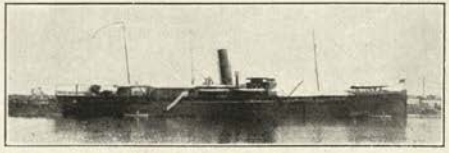


10 *Para* class. ***Amazonas*** (1908), ***Matto Grosso*** (1908), ***Piauhy*** (1908), ***Para*** (1908), ***Rio Grande der Norte*** (1909), ***Parahyba*** (1909), ***Alagoas*** (1909), ***Santa Catharina*** (1909), ***Parana*** (1909), ***Sergipe*** (1909). (5 more of this type *pro.*)

Yarrow type. Displacement 550 tons. Length 240 feet. Beam 25½ feet. *Max.* draught, feet. Armament: 2—4 inch, 4—3 pdrs., 2—18 in. tubes. Designed H.P. 8000 = 27 kts. Machinery: reciprocating. Yarrow boilers. Coal: 140 tons. Nominal radius: 3700 miles at 14 kts.

(All considerably exceeded designed speed on trial.)

Torpedo Depot Ship.



ITAJUBA.

Submarine Depot.

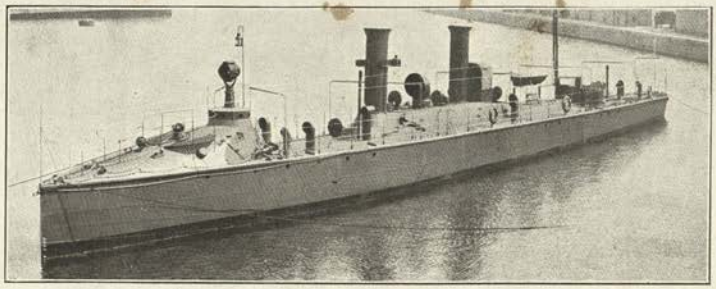
Building.

CAERA (Fiat-san Giorgio, 1914). 3800 tons. Dimensions: 328× 50× . Fiat Motors = 14 kts.

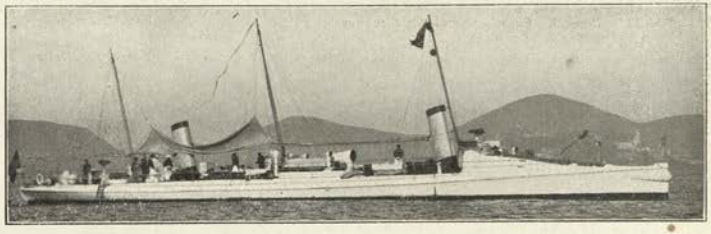
4 Torpedo Boats.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			feet
	First class—								
1	*Goyaz* (Y)	'07-'09	130		27			2	
3	*Silvado* (S)	1893	130	2200	28	30		3	8

S = Schichau. Y = Yarrow.



GOYAZ. 130 tons. Armament: 2—3 pdr., 2—18 inch tubes. Speed, 27 kts.



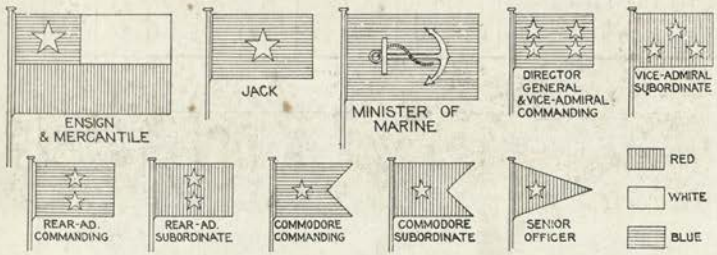
3 *Silvado* type. ***Silvado Pedro-Ivo, Pedro-Affonso.*** Armament: 2—1 pdr., 3—14 inch tubes.

Submarines.

3 Laurenti (F.I.A.T.) (1912).

CHILIAN FLEET.

Officially revised 1913 by order of the Minister of Marine



	Vice Almirante.	Contra-Almirante.	Capitan de Navio.	Capitan de Fragata.	Capitan de Corbeta.	Teniente 1°	Teniente 2°	Guardia Marina de 1a clase.	Guardia Marina de 2a clase.
Corresponding British or U.S.	*Vice-Ad.*	*Rear-Ad.*	*Captain.*	*Commander.*	*Lieut.-Comdr.*	*Senior Lieut.*	*Junior Lieut.*	*Sub. Lieut.*	*Midshipman.*

Other Branches the same without the star, and colours as follows:—Engineers (blue), Paymasters (white), Doctors (red).

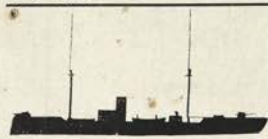
Personnel: About 7500, of whom about 1000 are conscripts, the rest volunteers.

Mercantile Marine: 95 steamers, of 68,268 tons net; 51 sailing vessels, 40,570 tons net.

Bases: Talcahuano. One dry dock, 545×80×28½ feet. One dock building, 742×107×39 feet. One small floating dock, 216×42×15 feet.

Valparaiso. Two small floating docks, 300 × 68 × 19 feet and 265 × 60 × 15 feet.

CI cone.



A P. Errazuriz.

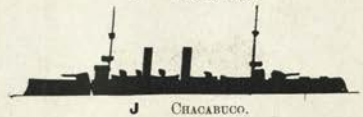
Almirante Cochrane
(*Torpedo School*)

D Jeneral Baquedano.

E Capitan Prat.

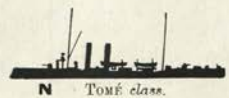
G Blanco Encalada.

F Esmeralda.



J Chacabuco.

K Ministro Zenteno.

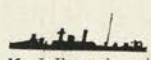


N Tomé *class.*

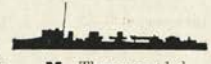
O Jeneral O'Higgins.

R Lynch *class* t.b.d.

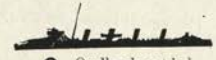
TORPEDO CRAFT. **CIT** cone.



K I. Hyatt *class* t.b.



M Thompson t.b.d.



Q Orella *class* t.b.d.
(*Also with higher funnels*).
O'Brien *class* t.b.d.

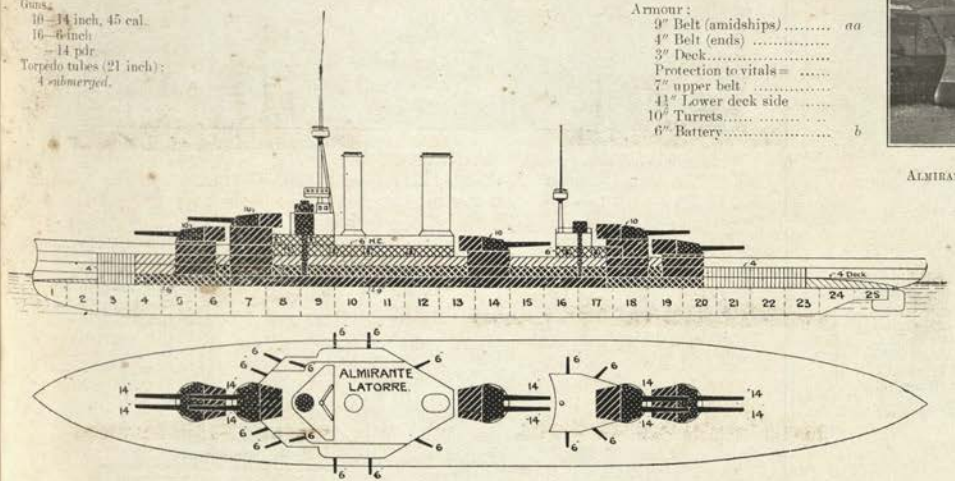
ALMIRANTE COCHRANE & ALMIRANTE LATORRE.

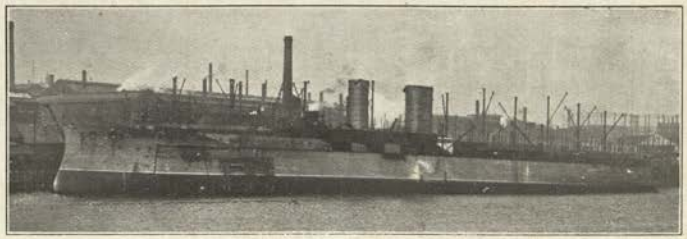
Displacement, 28,000 tons. Complement, 1000.

Length, 625 feet. Beam, 92½ feet. Mean draught, 28½ feet.

Guns:
10—14 inch, 45 cal.
16—6 inch
—14 pdr.
Torpedo tubes (21 inch):
4 *submerged*.

Armour:
9″ Belt (amidships)..... *aa*
4″ Belt (ends) .....
3″ Deck.....
Protection to vitals = ...
7″ upper belt .....
4½″ Lower deck side .....
10″ Turrets..... .....
6″ Battery..... *b*



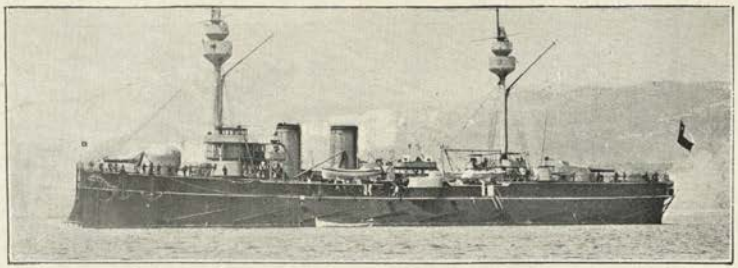


ALMIRANTE LATORRE. *Photo, Herrics.*

Machinery: Turbine, 4-shaft: (L.P.) Parsons; (H.P.) Brown-Curtis. Boilers: Yarrow. Designed H.P. 37,000 = 23 kts. Coal: *normal* 1200 tons; *maximum* 4000 tons. Also oil.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
A. Cochrane	Elswick	Vickers	1912	'14		Yarrow	
A. Latorre	Elswick (Walker)	Clydebank	1912	'14		Yarrow	

1888 OLD CHILIAN BATTLESHIP.



Before reconstruction. Now as plan.

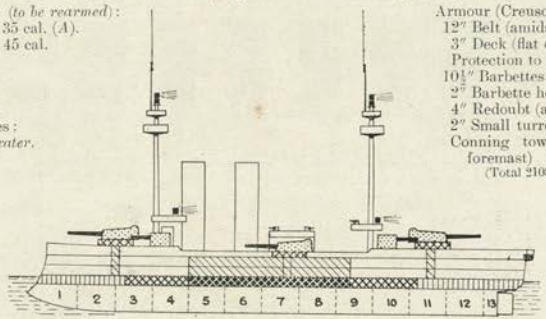
CAPITAN PRAT (Dec., 1890). *Reconstructed* 1909-10.

6901 tons. Complement 480.

Length, 328 feet. Beam, 60⅔ feet. *Maximum* draught, 26½ feet.

Guns (Canet) (*to be rearmed*):
4—9·4 in., 35 cal. (*A*).
8—4·7 in., 45 cal.
6—6 pdr.
4—3 pdr.
10—1 pdr.
5 Maxims.
Torpedo tubes:
4 *above water.*

Armour (Creusot):
12″ Belt (amidships) ... *a*
3″ Deck (flat on belt)...
Protection to vitals ...=*a*
10½″ Barbettes ..... *b*
2″ Barbette hoods ..... *f*
4″ Redoubt (amidships) *e*
2″ Small turrets..... *f*
Conning tower (abaft foremast) ?
(Total 2108 tons).



Ahead:
3—9·4.
4—4·7.

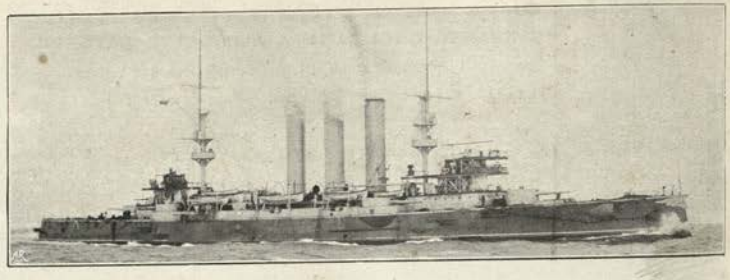
Astern:
3—9·4.
4—4·7.

Machinery: (1145 tons), 2 sets horizontal triple expansion. 2 screws. Boilers: new in 1909, 12 Babcock. Designed H.P. *after reconstruction*=19·5 kts. Coal: *normal* 400 tons; *maximum* 1100 tons=*circa* 4000 miles at 8 kts.

Notes.—All guns are electrically manœuvred, and all hoists are electric. Central loading positions. The belt is 6½ feet wide.

Laid down at La Seyne, 1888. Completed 1893. First cost, £391,000.

1896 CHILIAN ARMOURED CRUISER.



Now rigged as plan.

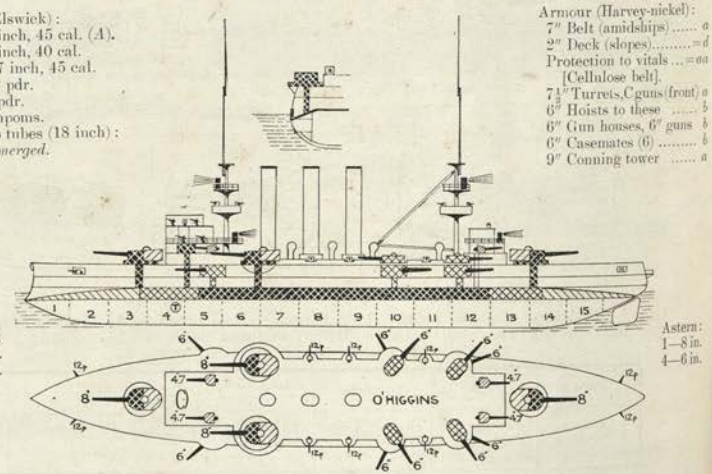
O'HIGGINS (March, 1897).

8500 tons. Sheathed and coppered. Complement 500.

Length (*p.p.*), 407 feet. Beam, 62¾ feet. *Mean* draught, 22 feet.

Guns (Elswick):
4—8 inch, 45 cal. (*A*).
10—6 inch, 40 cal.
4—4·7 inch, 45 cal.
10—12 pdr.
10—6 pdr.
2 Pompoms.
Torpedo tubes (18 inch):
2 *submerged.*

Armour (Harvey-nickel):
7″ Belt (amidships)..... *a*
2″ Deck (slopes).....=*d*
Protection to vitals ...=*aa*
[Cellulose belt].
7½″ Turrets, C guns (front) *a*
6″ Hoists to these ..... *b*
6″ Gun houses, 6″ guns *b*
6″ Casemates (6) ..... *b*
9″ Conning tower ..... *a*



Ahead:
3—8 in.
2—6 in.

Astern:
1—8 in.
4—6 in.

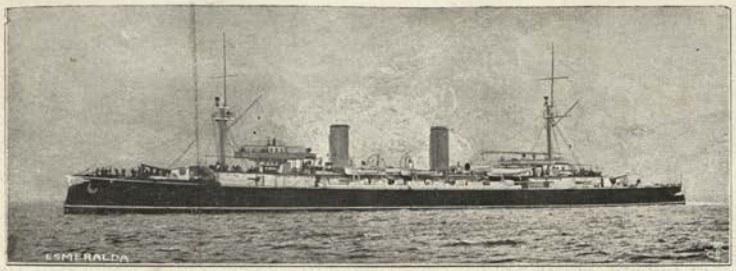
Broadside: 3—8 in., 5—6 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: 30 Belleville (in 3 groups). Designed H.P. *natural* 10,000=19 kts.; *forced* 16,500=21·25 kts. Coal: *normal* 700 tons; *maximum* 1200 tons.

Notes.—The belt is 7 feet wide, and varies from 7 to 5 inches in thickness.

Laid down at Elswick, April, 1896. Completed 1898. First cost, £700,000 *complete.*

1895 CHILIAN BELTED CRUISER.



ESMERALDA (1896).

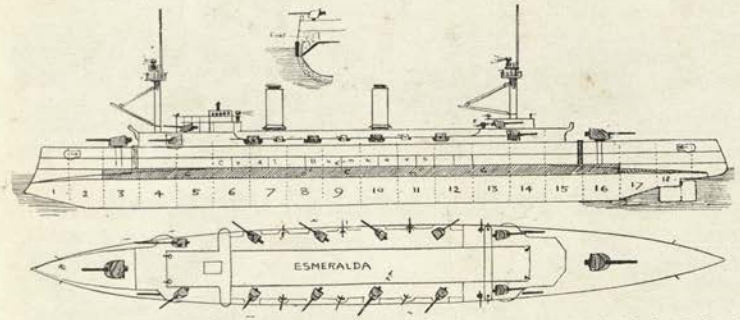
7000 tons. Sheathed and coppered. Complement 500.

Length (*p.p.*), 436 feet. Beam, 53 feet. Draught (*mean*), 20¾ feet.

Guns (Elswick):
- 2—8 inch, 40 cal. (*B*).
- 16—6 inch, 40 cal.
- 8—12 pdr.
- 9—6 pdr.
- 2—3 pdr.
- 8 Maxims.

Torpedo tubes (18 inch):
- 2 *submerged*.
- 1 *above water* (bow).

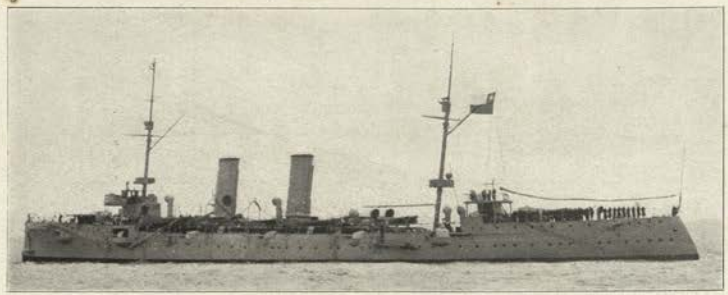
Armour (Harvey):
- 6″ Belt ..... *c*
- 2″ Deck..... = *d*
- Protection to vitals ..... = *b*
- 6″ Bulkheads ..... *e*
- 4½″ Shields to guns .....
- 4½″ Hoists.....



Machinery: 2 sets 4 cylinder triple expansion. 2 screws. Boilers: 2-ended cylindrical. Designed I.H.P. *natural* 16,000 = 22·25 kts. Coal: *normal* 550 tons; *maximum* 1350 tons. *Trials*: I.H.P. 10,800 = 20 kts.; 16,000 = 23·05 kts.

Notes.—At sea (1898) she made 21·2 knots easily. Present speed is about 19 knots, *maximum*. The belt is 350 feet long by 7 feet wide. Behind the belt the deck is 1½ inches. Laid down at Elswick, 1895. Completed 1897.

1897 CHILIAN PROTECTED CRUISER.



Photo, Silk.

Note.—*Chacabuco* made the remarkable speed of 24·75 on a three hours' trial in December, 1909.

CHACABUCO (1898) (purchased 1902).

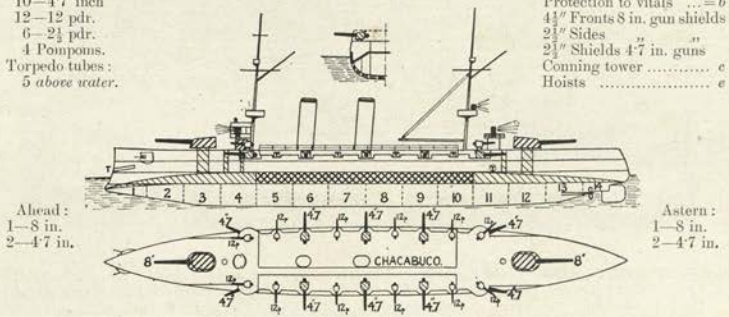
4300 tons. Complement 400.

Length (*p.p.*), 360 feet. Beam, 46½ feet. *Maximum* draught, 20 feet.

Guns (Elswick):
- 2—8 inch, 45 cal. (*A*).
- 10—4·7 inch
- 12—12 pdr.
- 6—2½ pdr.
- 4 Pompoms.

Torpedo tubes:
- 5 *above water*.

Armour (Harvey nickel):
- 4½″ Deck..... = *b*
- Protection to vitals ... = *b*
- 4½″ Fronts 8 in. gun shields
- 2½″ Sides " " "
- 2½″ Shields 4·7 in. guns
- Conning tower ..... *c*
- Hoists ..... *e*



Ahead:
- 1—8 in.
- 2—4·7 in.

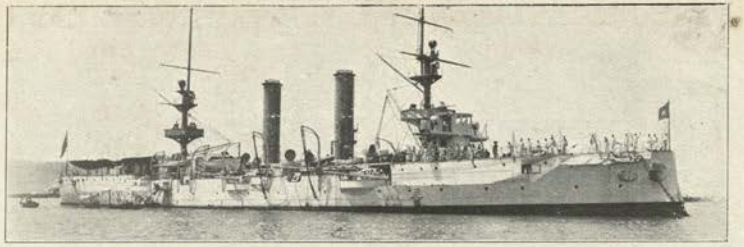
Astern:
- 1—8 in.
- 2—4·7 in.

Broadside: 2—8 in., 5—4·7 in.

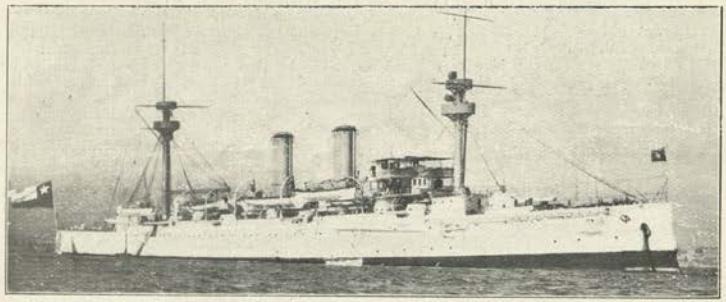
Machinery: Boilers, cylindrical. I.H.P. 15,000 = 24 kts. *forced*. 2 screws. Coal: *normal* 300 tons; *maximum* 1000 tons. 8 inch guns electrically controlled. No fire-controls, but excellent sights (U.S. Navy pattern).

Laid down at Elswick, 1897 Completed 1902.

Protected Cruisers.

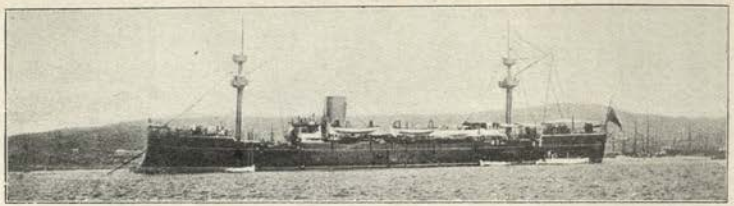


MINISTRO ZENTENO (Elswick, 1896.) 3600 tons. Length, (*p.p.*) 330 feet. Beam, 43¾ feet. *Mean* draught, 17 feet. Armament: 2–6 in. 45 cal., 6—6 inch, 40 cal., 10—6 pdr., 4—1 pdr., 4 Maxims. 2 *above water* tubes. Armour: 3½″ Deck, 4″ Conning tower. Designed H.P. 7500=20 kts. Cylindrical boilers. Coal: *normal* 700 tons; *maximum* 1000 tons.



Photo, Abraham.

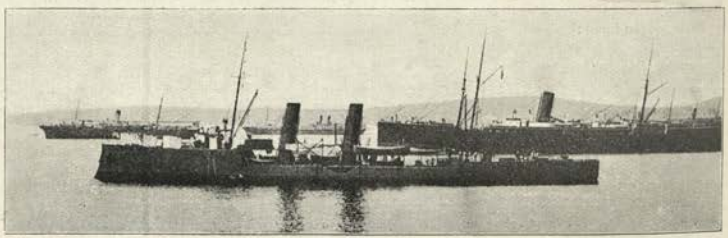
BLANCO ENCALADA (Elswick, 1893). 4420 tons. Sheathed and coppered. Complement 427. Length (*p.p.*), 370 feet. Beam, 46½ feet. *Maximum* draught, 20½ feet. Armament: 2—8 inch, 40 cal., 10—6 inch, 40 cal., 12—3 pdr. 5—18 inch tubes (*above water*). Armour: 4″ Deck, 6″ Shields to 8″ guns, 6″ Conning tower. Boilers: cylindrical (retubed 1908-9). Designed H.P. *forced* 14,500=22·75 kts. Coal: *maximum* 900 tons.



(Fighting tops were removed on refit.)

PRESIDENTE ERRAZURIZ (1890) (1908). 2100 tons. Complement, 171. Dimensions: 262 × 36 × 20 feet. Guns (new in 1908): 4—6 inch, 45 cal., 2—4·7 inch, 45 cal., 4—6 pdr., 4—1 pdr., 2 machine. Torpedo tubes: 3—14 inch (*above water*). Armour: 2¼″ Deck. Machinery: 2 sets horizontal triple expansion. 2 screws. Boilers: Belleville (1908). Designed H.P. 5400=19 kts. (made in 1909). Coal: *normal* 200 tons. Laid down at La Seyne, 1889.

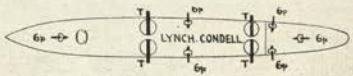
Torpedo Gunboats.



TOMÉ (ex *Almirante Lynch*) (1890) & **TALCAHUANO** (ex *Almirante Condell*) (1890).
Displacement, 750 tons. Length, 230 feet. Beam, 27½ feet. *Maximum* draught, 12½ feet.

Guns:
6—6 pdr., 50 cal.
Torpedo tubes (14 inch):
5 *above water*.

Armour:
Double skin (amidships)
1″ Bulkheads.

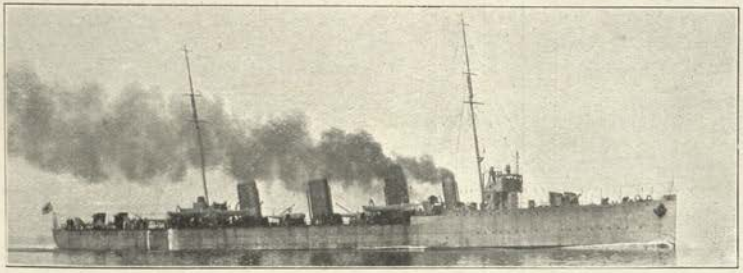


Machinery: 2 sets triple expansion. 2 screws. Boilers: Belleville, *without* economisers (1900) Designed I.H.P. 4000=20 kts. (exceeded on *trial*). Coal: 100 tons.
Laid down at Birkenhead, 1889. Completed 1892. Reconstructed 1900.
Both exceeded 20 kts. on 8 hours full power trials, 1909.

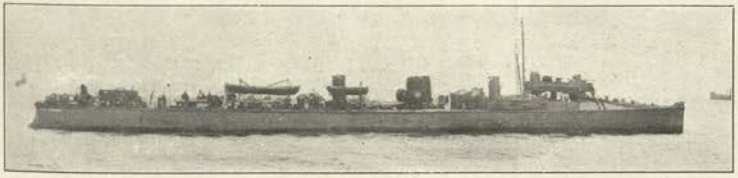
13 Destroyers.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons.		kts.	tons			feet
6	*Lynch* (W) (*turbine*)	'11-'12	1430	27,000	32	427 coal, 80 oil	..	...	...
1	*Capitan Thompson* (C)	....	480	...	31	...	...	2	...
2	*C. O'Brien* (L)	1902	350	6250	30	90	65	2	9¼
4	*C. Orella* (L)	1896	300	6000	30	90	65	2	8½

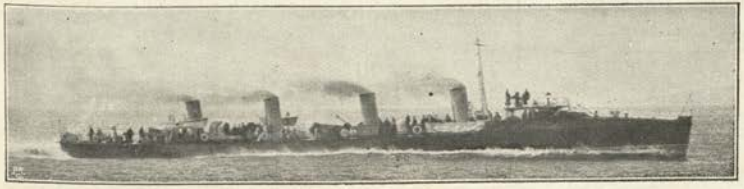
(C) = Clydebank. (L) = Laird. (W) = White.



6 *White*: **Almirante Lynch, Al. Condell, Al Doni, Al Simpson, Al Recolledo, Al. Riceron.** Dimensions: 320 × 32½ × 11 feet. *Normal* displacement: 1430 tons. *Full load*: 1800 tons. Armament: 6—4 inch, 2 M., 3—18 inch tubes. Boilers: White-Foster. 3 screws.



1 *Clydebank*: **Capitan Thompson.** Armament: 1—12 pdr., 5—6 pdr., 2—18 inch tubes. *Photo, Abraham.*



2 *Laird*: **Capitan O'Brien** & **Capitan Merino Jarpa.** Armament: 1—12 pdr., 5—6 pdr., 2—18 inch tubes, one amidships, one aft. Boilers: Laird-Normand.
And as O'Brien except that the funnels are shorter:—
4 *Laird*: **Capitan Orella, Capitan Munoz Gamero, Teniente Serrano,** & **Guardia Marina Riquelme.** Armament: 1—12 pdr., 5—6 pdr., 2 tubes (18 inch) carried, one amidships and one aft. Boilers: Normand. Coal: 90 tons. *Nominal* radius 3500 feet at 13 kts. All reboilered and refitted 1909.

5 Torpedo Boats.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			feet
5	*Ing. Hyatt* (Y)	'96-'98	140	2200	27·5	40	28	3	7¾

(Y) = Yarrow.

There are also 4 very old (1881) Yarrow boats, twin funnels, on subsidiary service.

5 **Ingeniero Hyatt, Cirujano Videla, Ingeniero Mutilla, Guardia Marina Contreras** and **Teniente Rodriguez.** Armament: 3—3 pdr., 3 tubes (14 inch).

2 Submarines.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			feet
2	*Holland*	'11-'13	...	..	..	...	...	..	...

Antofagasta, Iquique.

Transports.

Photo wanted.

RANCAGUA (——). 8000 tons. 16 kts.

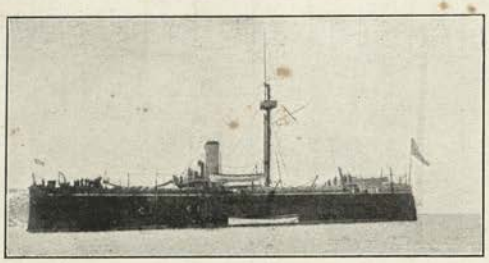
Photo wanted.

MAIPO (——). 6000 tons. 12 kts.

Photo wanted.

CASMA (——). 3000 tons. 16 kts.

Special Service.
Torpedo School Ship.



ALMIRANTE COCHRANE (1874). 3500 tons. Guns: 4—4·7 inch, 4—6 pdr., 4—1 pdr. Armour (iron): 9″—4½″ Belt, 8″ Battery. Designed speed: 12 kts. Cylindrical boilers.

Surveying Ship.

GENERAL BAQUEDANO, of 2500 tons, sheathed and coppered. Armed with 4—45 cal., 4·7 inch guns, and 2—12 pdrs. I.H.P. 1500 = 13·75 kts. Belleville boilers. Coal: 300 tons. Built by Elswick. Best recent speed: 12 kts.

Photo wanted.

METEORO (——). 800 tons. 14 kts.

Special Service.

Photo wanted.

PORVENIR (——). 350 tons. 16 kts.

Photo wanted.

YECHO (——). 300 tons. Speed: 14 kts.

1 funnel, 2 masts.

Photo wanted.

CONDOR (1889), **HUEMUL** (1889), **TORO** (1879). 250 tons. Speed: 11 kts. Armament: 1—4 inch, 1—3 pdr.

COLOMBIA.

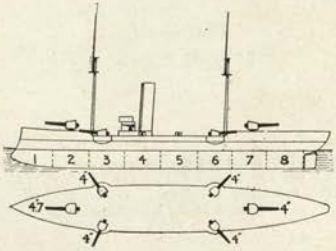
ENSIGN

MERCANTILE

CA cone.

K A. Lezo.

ALMIRANTE LEZO (*ex* Carthagena, *ex* El Baschir), (1892). Displacement 1200 tons. Complement . Length, 229½ feet. Beam, 32¾ feet. Draught, 8½ feet. Guns: 2—4·7 inch, 4—4 inch, 4—14 inch tubes. Designed H.P. 2300 = 16 kts. Built by Orlando, for Morocco. Purchased 1902.



COLOMBIA *(Continued).*

Yacht, 1 funnel, 3 masts.

GENERAL PINZON (1881). 740 tons.

1 funnel, 2 masts.

BOLIVAR (*ex* Libertador, *ex* Ban Righ). 981 tons gross. Guns: 2—3 pdr.

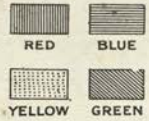
(On Pacific Coast.)

BOGOTA (*ex* Jesse Banning). Purchased 1902. Guns: 2—3 pdr.

COSTA RICA ENSIGN
Mercantile the same without centre device

COSTA RICA.

1 Yarrow torpedo boat (1892). Speed, 15 kts.



RED BLUE YELLOW GREEN

CUBA.

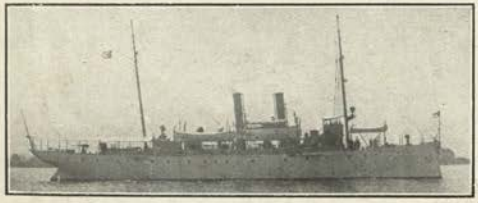
CUBA

PATRIA.

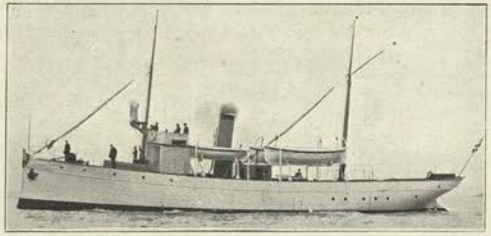
10 DE OTOUBRE.

HATUEY.

CUBA (Cramp, 1911). 2055 tons. Dimensions: (*p.p.*) 260×39×14 feet. Armament: 2—4 inch, 4 –3 pdr. H.P. 6000=18 kts. Babcock boilers. Coal, 250 feet.



PATRIA (Cramp, 1911). 1100 tons. Dimensions: (*p.p.*) 200×36×13 feet. Guns: 2—12 pdr.

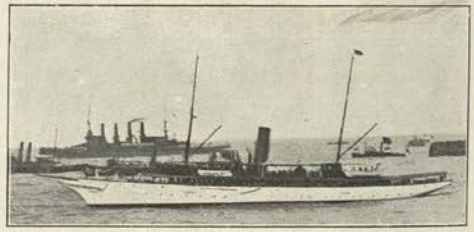


10 DE OTOUBRE, & 24 DE FEBRERO (White, 1911). 165 tons. Guns: 1—1 pdr. Speed, 10½ kts.

Photo wanted.

1 funnel, 2 masts.

BAIRE (Schichau, 1906). 500 tons. Dimensions: 196×23×9 feet. Guns: 2—6 pdr., 2—3 pdr. H.P. 1200=14 kts. Babcock boilers.



Photo, Pictorial News Co.

HATUEY (1903). 540 tons. Guns: 2—6 pdr., 2—3 pdr., 2—1 pdr. Speed 13 kts. (*President's Yacht*).

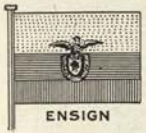
Photo wanted.

1 funnel, 2 masts.

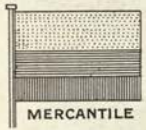
YARA (Glasgow, 1895). 450 tons. Dimensions: 155×26×13 feet. Guns: 2—6 pdr., 2—1 pdr. H.P. 600=12 kts. (*Also*

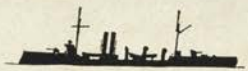
E. VILLUENDAS (1899). 180 tons. Guns: 2—3 pdr. 16 kts. (also 8 steam launches.)

ECUADOR.



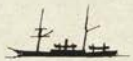
ER cone.





M Bolivar.

H Papin.

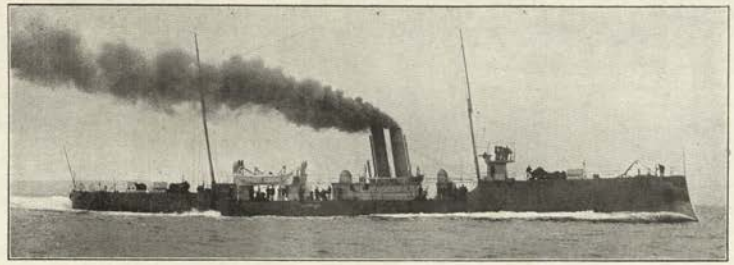


L Cotopaxi.

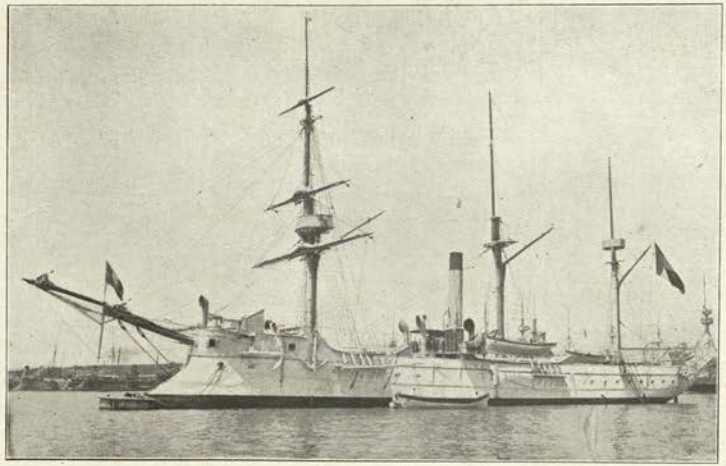
S Tungurahua.

Other Ships.

Old gunboat **COTOPAXI,** 186 tons, and an old Yarrow t.b., **TUNGURAHUA** (Non-effective).



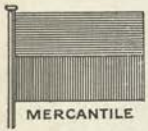
LIBERTADOR BOLIVAR (*ex A. Simpson*) (1896), (purchased 1907). Displacement 800 tons. Length, 240 feet. Beam, 27½ feet. *Maximum* draught, 13 feet. Guns (Elswick): 2—4·7 inch, 4—3 pdr., 2 Maxims. Torpedo tubes (18 inch): 3 *above water*. Armour (Harvey): 1″ Belt, 4½″ Gun shields, 1″ Hood to steering gear, 1″ Bulkheads. Machinery: 2 sets triple expansion. 2 screws. Boilers: 4 Normand. Designed I.H.P. *forced* 4500=21 kts. Coal: 100 tons. Built by Laird.

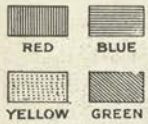


Ex **PAPIN** (1886, French navy). 811 tons. Guns: two old 5·5 inch, 1—4 inch, five small. Designed H.P. 860=12 kts. Single screw, composite.

HAYTI.

HI cone.





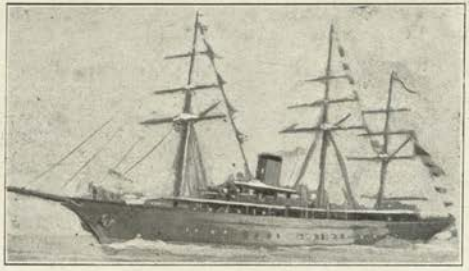
F *Ex* UMBRIA.

K PR. A. SIMON.

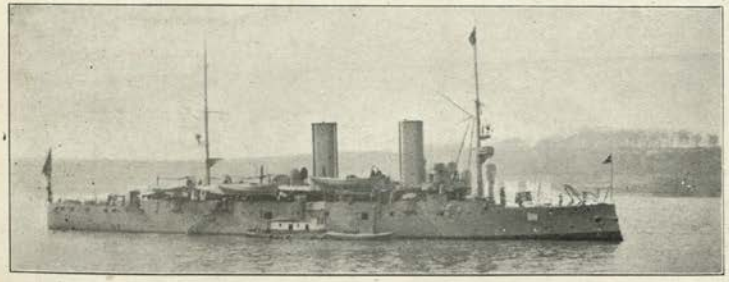
L C. LA MORT.

N FERRIER.

M T. L'OUVERTURE.

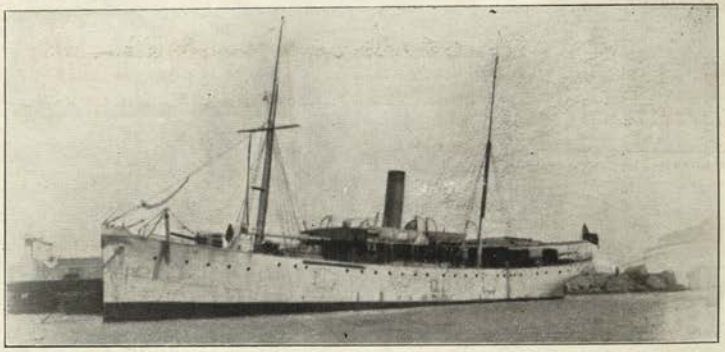


FERRIER (*ex* U.S. Yacht, *American*). Purchased 1911.

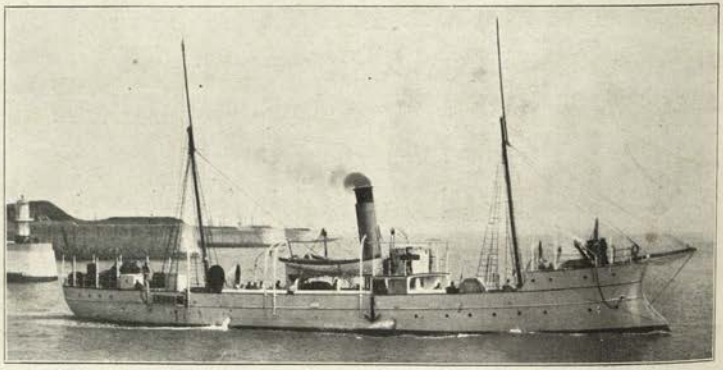


Photo, E. G. Romanes, Esq.

Ex **UMBRIA** (1891) (Purchased 1911). 2281 tons. Guns: 4—6 inch 6—4·7 inch, 8—6 pdr., 10—1 pdr., 2—14 inch torpedo tubes. 2^{c} Deck. Designed H.P. 7500=18 kts. Built by Orlando. (See *Lombardia* class, Italy.)



PRESIDENTE ANTOINE SIMON (*ex Nord Alexis*). President's yacht. Guns: 2—4·7 in., 6—3 pdr.



CAPOIS LA MORT (1893), and **ALEXANDRE PETION** (1893). 300 tons. Guns: 1—4 inch, 4—1 pdr. H.P. 678=14 kts. Built by Forges et Chantiers de la Medit. at Graville.

MEXICO.

MO cone.

ENSIGN

MERCANTILE

O Gen. Guerrero.

P Progreso.

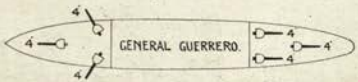
H Tampico *class.*

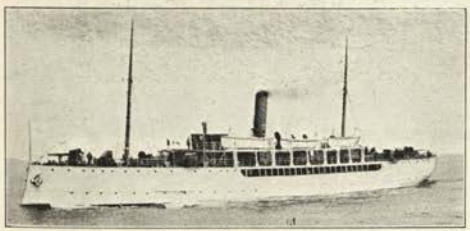
Independencia, etc.
(Harbour service.)

J Zaragoza

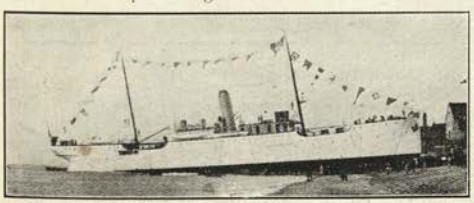
N Bravo *class.*

Cruiser Transports.



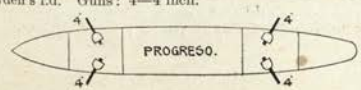


GENERAL GUERRERO (Vickers, 1908). 1880 tons. Guns: 6—4 inch, 2—3 pdr. Designed H.P. 1200 = 12 kts.



Photo, C. de Grave Sells, Esq.

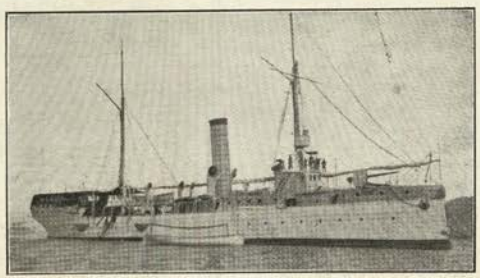
PROGRESO (Odero, 1907). 1590 tons. Dimensions: $230 \times 34 \times 9\frac{3}{4}$ feet (*mean*). H.P. 1400 = 14 kts. 1 screw. Cylindrical boilers. Howden's f.d. Guns: 4—4 inch.



Gunboats.

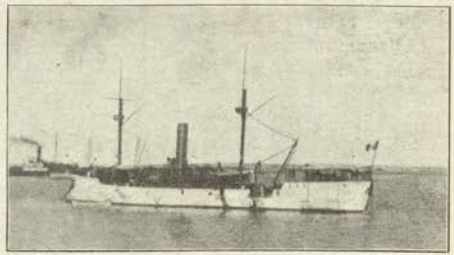
Photo, J. Romanez, Esq.

BRAVO (Odero, 1903), **MORALES** (Odero, 1903). 1200 tons. Comp. 116. Dimensions: $249 \times 34 \times 10$ (*mean*) feet. Armament: (Bethlehem). 2—4 inch, 6—6 pdr., 1—14 inch tube (bow) *above water*. Designed H.P. 2600 = 16 kts. Blechynden boilers. 2 screws. Coal: 200 tons.



TAMPICO & **VERA CRUZ** (Elizabeth Port, N.J., 1902). 980 tons. Comp.: 98. Dimensions: $200 \times 33 \times 11$ feet. Armament: (Bethlehem, 1913). 2—4 inch, 6—6 pdr. 1—14 inch tube (bow) *above water*. Designed H.P. 2400 = 16 kts. Mosher boilers. 2 screws. Coal: 170 tons.

Old Cruiser.



Photo, Oscar Parkes, Esq.

ZARAGOZA (Granville, 1891) (refit 1910). 1200 tons. Comp. 270. Dimensions: $213\frac{1}{4} \times 33 \times 16$ feet. Guns (Schneider-Canet): 6—4·7 inch, 40 cal., 2—6 pdr., 2—1 pdr. Designed H.P. 1300 = 15·5 kts. Cylindrical boilers. 1 screw. Coal: 200 tons.

Miscellaneous.

(No photo available.)

OAXACO. Transport.

There are possibly 4 other steamers in existence, unarmed or nearly so.

Harbour Service.

3 old Laird built schooners, one funnel: **DEMOCRATA** (1875), **INDEPENDENCIA** (1874), **LIBERTAD** (1874). All about 450 tons.

PANAMA.

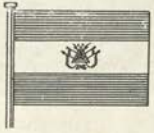
PN cone.

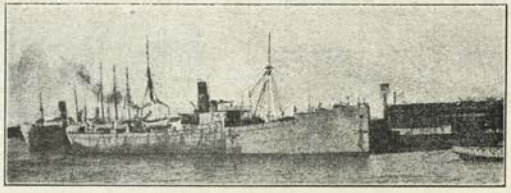
PADILLA (*ex* Cuscatlan), (1890). 75 tons. Armament: 1—1 pdr. Speed, 10 kts.

DARIAN (1895) and **GATAN** (1897). Stern wheel gunboats of 400 tons. Armament: 3—1 pdr. $\frac{1}{4}$" armour to engines. Designed speed 15 kts. (*ex Esperanza* and *Gen. Nerino*).

CHERCUITO (1896). 643 tons. Armament: 2—1 pdr. Designed speed 12 kts.

NICARAGUA.





Ex Venus.

PERU.

Mercantile flag the same but without centre device.

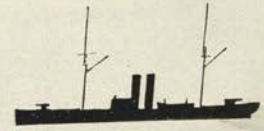
Rear Admiral has one sun.

Colour of Ships: Brown grey.

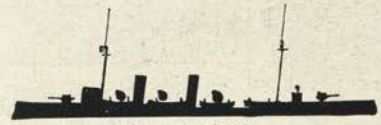
G Chalaio.

V Iquitos.

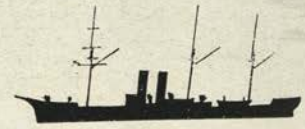
O C. Bolognesi.



Q Lima.



N A. Grau.



R Constitucion.

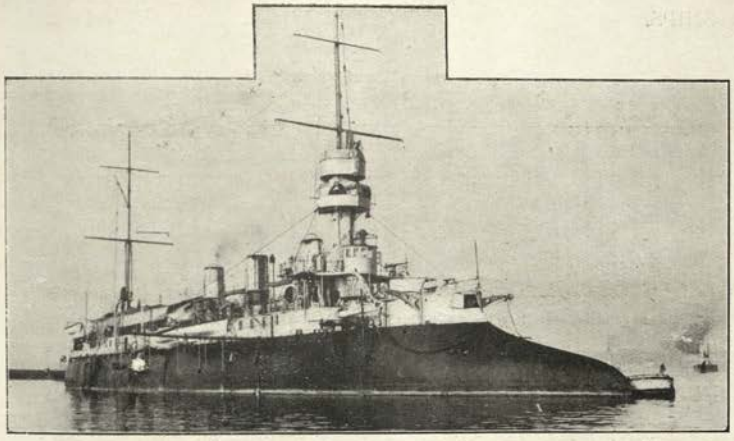
S *Ex* Dupuy de Lôme.

Uniforms.

Vice-Almirante. Contra-Almirante. Capitan de Navio. *Captain.* Capitan de Fragata. *Commander.* Capitan de Corbeta. Teniente 1°. *Lieut. Senior.* Teniente 2°. *Lieut. Junior.* Alferez de Fragata. *Sub. Lieutenant.*

Engineers the same without the sun.

Other branches have the same stripes without the sun, and in addition colours as follows —
Torpedo, *light blue*; Constructor, *green*; Electricians, *light green*; Doctors, *red*; Paymasters, *blue*.



Photo, H. Laurent.

COMMANDANTE AGUIRRE (*Ex Dupuy de Lôme*). (Brest, 1890). (Purchased 1911.)
Displacement, 6400 tons. Complement, 521.
Length (*waterline*), 374 feet. Beam, 51½ feet. *Maximum* draught, 26¼ feet.

Guns (M. '87):
2—7·6 inch (*B*)
6—6·4 inch
4—9 pdr.
12—3 pdr.
Torpedo tubes (18 inch):
4 *above water*
(behind armour)

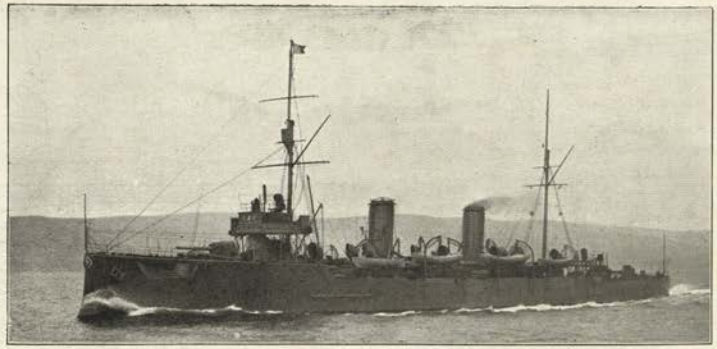
Armour (steel):
4¾″ Belt (amidships) ... = *c-d*
Belt ends .....
2½″ Deck (slopes).....
Protection to vitals ..... = *b*
4″ Turrets..... *c*
4″ Turret bases ..... *c*
4″ Secondary turrets ... *c*
4¾″ Conning tower ..... *d*
(Total weight *about* 1400 tons.)

Ahead:
2—7·6 in.
3—6·4 in.

Astern:
2—7·6 in.
3—6·4 in.

Broadside: 1—7·6 in., 4—6·4 in.

Machinery: Vertical triple expansion, 3 screws. Boilers: (1904) Normand Sigaudy. Designed H.P. 13,000=22 kts. Coal: *normal* 900 tons; *maximum* 1450 tons.
Engineering Notes.—Re-engined 1904. Original designed speed: 20 kts.

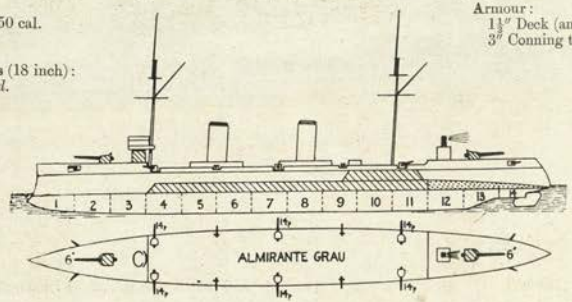


CORONEL BOLOGNESI. The *A. Grau* is identical *except* that she has a poop.

ALMIRANTE GRAU (March, 1906) & **CORONEL BOLOGNESI** (Nov., 1906).
Displacement, 3200 tons. Complement, 300.
Length (*waterline*), 370 feet. Beam, 40½ feet. *Maximum* draught, 16½ feet.

Guns:
2—6 inch, 50 cal.
8—14 pdr.
8—1 pdr.
Torpedo tubes (18 inch):
2 *submerged*.

Armour:
1½″ Deck (amidships) = *c*
3″ Conning tower ... *c*



Astern:
1—6 in.

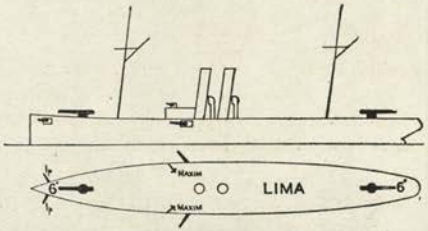
Ahead:
1—6 in.

Broadside: 2—6 in.

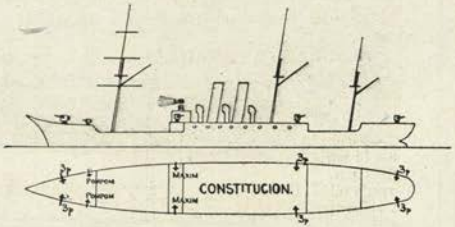
Machinery: 4 cylinder vertical triple expansion. 2 screws. Boilers: 10 Yarrow. Designed H.P. 14,000=24 kts. Coal: *normal*, tons; *maximum*, 500 tons.

Name.	*Builder.*	*Laid down.*	*Completed.*	*Trials: hours at 4/5.*	*hours at full power.*	*Boilers.*	*Present best speed.*
Al. Grau	Vickers			= kts.	14,144=24·64 kts.	Yarrow	About 21 kts.
Cor. Bolognesi	Vickers						

LIMA.



CHALAIO.



IQUITOS.

LIMA (Kiel, 1881). 1700 tons. Guns: 2 old 6 inch Krupp B.L., 2—4·7 inch, 2—1 pdr., 2 Maxims. Designed I.H.P. 1800 = 16·2 kts. 2 screws.

CONSTITUCION. Guns: 6—3 pdr., 2 Maxims.

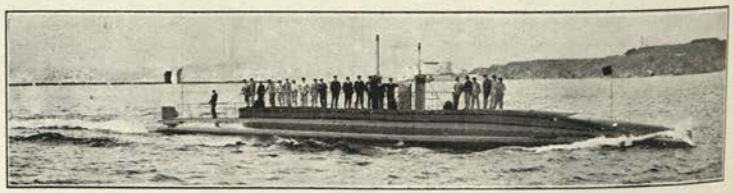
IQUITOS. Guns: Small Q.F. armament.

CHALAIO. (Wood). Guns: 2—3 inch, Krupp B.L.

Destroyer.

Teniente Rodriguez (1909) (*ex Actée*). 500 tons. H.P. 12,000 = 35 kts. Zoelly turbines.

Submarines.

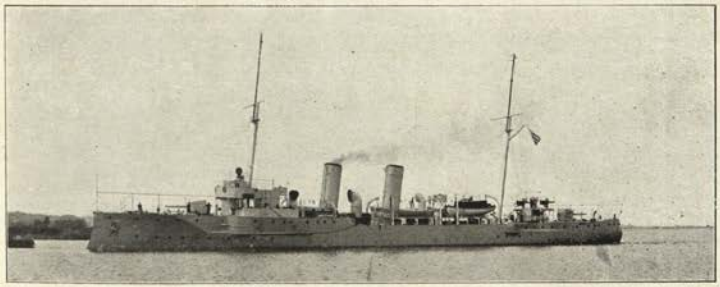


FERRÉ (1912), and **PALACIOS** (1913) Schneider type. $\frac{300}{440}$ tons. Schneider-Carels oil motor. H.P. $\frac{400}{200} = \frac{14}{9}$ kts.

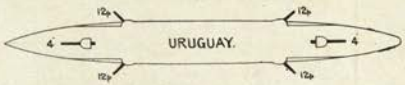
URUGUAY NAVY. UY cone.

AO 18 DE JULIO.

GH URUGUAY.



URUGUAY (Vulkan Co., 1910). 1400 tons. Guns (Skoda): 2—4·7 inch, 4—12 pdr., 6—1 pdr (Vickers). 2—18 inch tubes. H.P. 5700=23 kts. Coal: 210 tons. *Nominal* radius: 3000 at 12 kts.



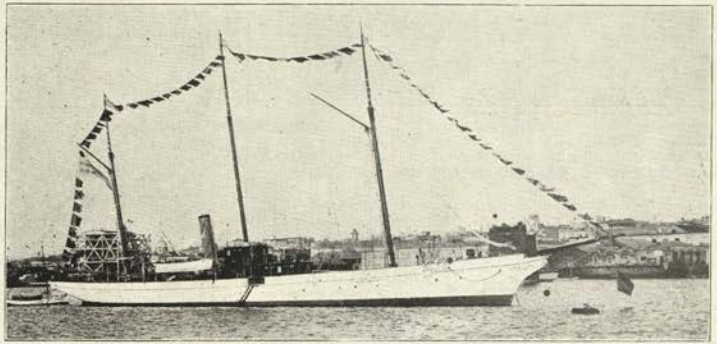
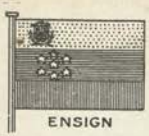
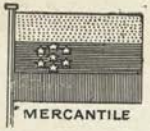


Photo by favour of Teniente T. Lopez y Ferreyra.

18 DE JULIO. 678 tons. Complement, 85. 4 guns and 2 machine guns.

VENEZUELAN NAVY.





G Zamora

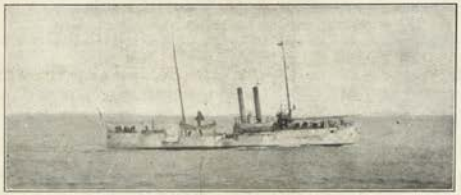
K Miranda.

M Zumbador.

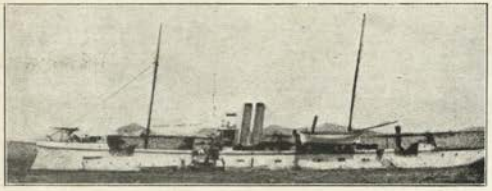
L Restaurador.

N 23 de Maio.

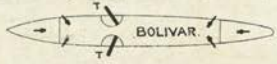
P Bolivar.

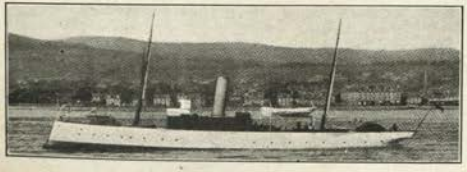


MARESAL SUCRE (1886) (*ex Isla de Cuba*). 1030 tons. Dimensions: 192×30×12¼ feet. Guns: 2—4 inch, 40 cal., 2—6 pdr., 6—3 pdr., 2—1 pdr. H.P. 1000=14 kts. Coal: 159 tons.



BOLIVAR (*ex* Spanish). 571 tons. Dimensions: 190×32×13 feet Guns: 6—6 pdr., 2—14 inch tubes. Speed: 10 kts.

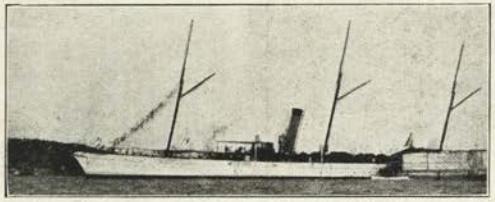




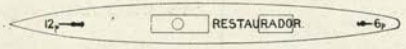
MIRANDA (Clydebank, 1895). 200 tons. Guns: 2—6 pdr., 1 machine. *Nominal* speed: 12 kts.

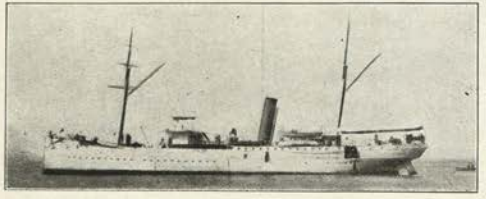
Maresal Sucre.

H Margarita t.b.



RESTAURADOR (1884). 568 tons. Dimensions: 243 × 26 × 11 feet. Guns: 1—12 pdr., 1—6 pdr., 2 machine. Speed: 12 kts.

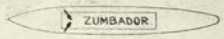


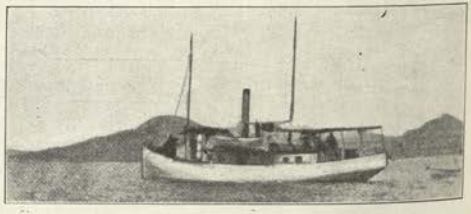


ZAMORA. 740 tons. Guns: 2 machine.

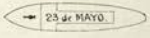
Photo by favour of Ellis Gren & Co., N.Y.

ZUMBADOR. 351 tons. Guns: 2—2 pdr.





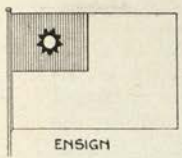
23 de MAYO. 130 tons. Guns: 1 machine.

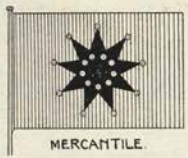


Torpedo Boat.

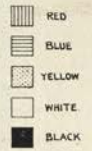
Margarita (1887). 97 tons. Guns: 4—3 pdr. 2—14 inch tubes. Old Thornycroft boat.

CHINESE FLEET.


ENSIGN


MERCANTILE.

JACK.



Uniforms.

Admiral. Vice-Admiral. Rear-Admiral. Commodore. Captain. Commander. Lt.-Commander. Lieutenant. Sub-Lieutenant.

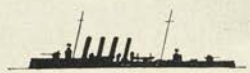
New Programme.

One cruiser of 4900 tons, three cruisers of 1900 tons *building* Monfalcone. Dimensions: 359×39×16 ft. Armament: 10—4 inch Skoda, 2 tubes. Designed H.P. 30,000=32 kts. Parsons turbines. Yarrow boilers. Coal and oil fuel.

K cone. CHINESE IDENTIFICATION AND SIGNAL SILHOUETTES.

J Hai-Chi.

L Hai-Yong *class.*


M Fei-Ying.

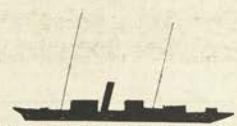
Q Kien-Wei *class.*

R Kwang-Ting.

T Kiang-Yuang *class.*

U Chiu-Tai *class.*

V Ying-Swei *class.*


L Lien Ching (Admiralty yacht).

Personnel: ?

Arsenals: (1) Foochow; (2) Taku; (3) Kiangnan, Shanghai; (4) Whampoa.

Docks.		Feet.		Docks.		Feet.	
At (1)	*a*	480×78×23	Govt.	At (3)	*a*	340×39 ×19	Private.
	b	330×54×16				528×77½×23	
	c	390×55×15	Private.		*b*	500×80 ×22	Private.
At (2)	*a*	340×39×14	Govt.			400×57 ×11	
	b	225×36×10	Private.			And three smaller.	
	c	315×36×11		At (4)	*a*	500×85×14	Govt.
		Also two smaller.				350×59×18	

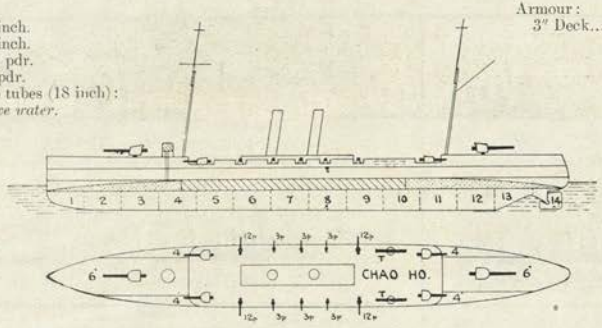
YING SWEI (1911) & CHAO-HO (1911).

Normal displacement, 2750 tons. Complement, 270.

Length (*p.p.*), 300 feet. Beam, 39 feet. Draught, 15 feet.

Guns:
2—6 inch.
4—4 inch.
4—12 pdr.
6—3 pdr.
Torpedo tubes (18 inch):
2 *above water.*

Armour:
3″ Deck.....



Machinery: Parsons turbine. 4 screws. Designed H.P. 8000 = 22 kts. Coal: *normal* tons; *maximum* tons.

Name	*Builder*	*Machinery*	*Laid down*	*Completed*	*Trials*	*Boilers*	*Best recent speed*
Ying Swei	Vickers	Vickers	1910	1912			
Chao-Ho	Elswick	Hawthorn	1910	1912			

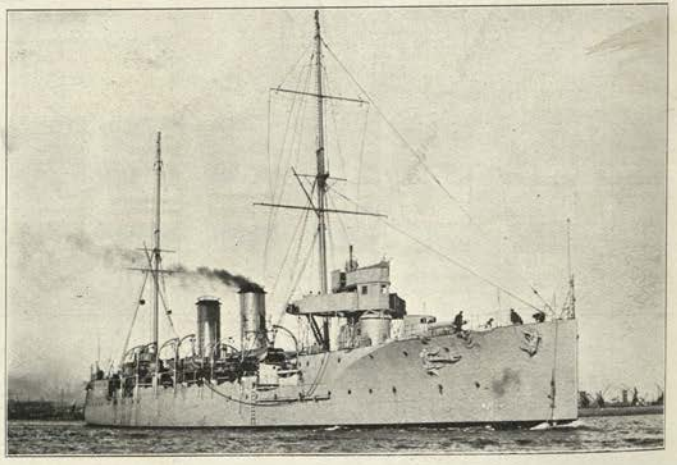
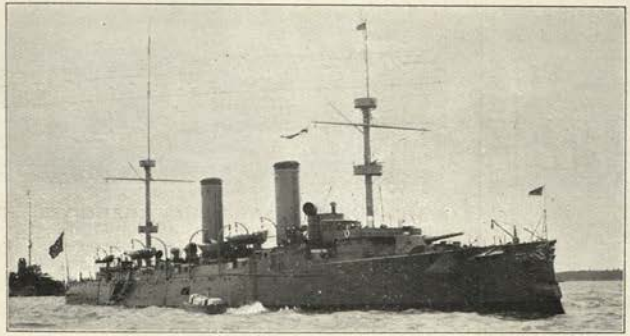


Photo by favour of Messrs. Vickers.



Photo, Symonds & Co.

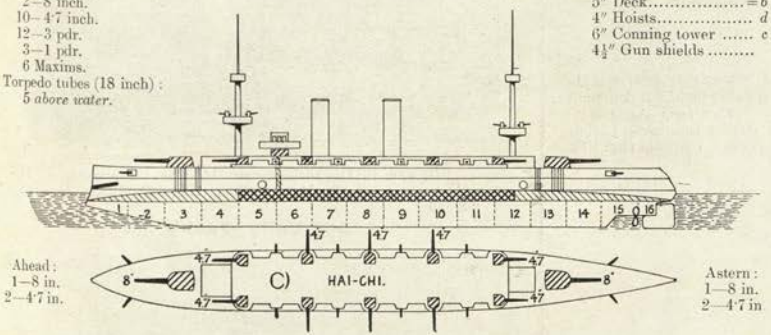
靖 海 HAI-CHI (1898).

Displacement, 4300 tons. Complement, 450.

Length (*over all*), 396 feet. Beam, 46½ feet. *Mean* draught, 16¾ feet

Guns (Elswick):
2—8 inch.
10—4·7 inch.
12—3 pdr.
3—1 pdr.
6 Maxims.
Torpedo tubes (18 inch):
5 *above water.*

Armour (Harvey):
5″ Deck.....= *b*
4″ Hoists..... *d*
6″ Conning tower ..... *c*
4½″ Gun shields .....

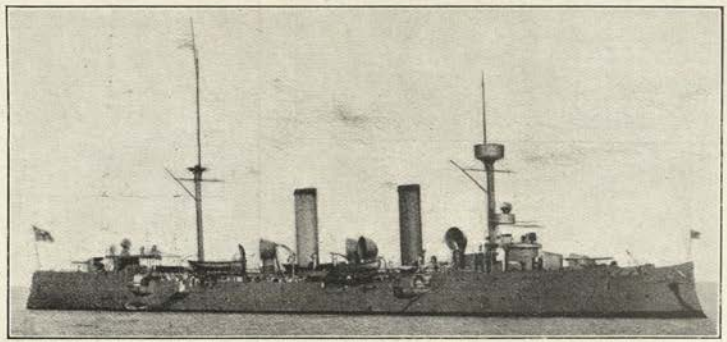


Ahead:
1—8 in.
2—4·7 in.

Astern:
1—8 in.
2—4·7 in

Machinery: 2 sets triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. *forced* 17,000 = 24 kts. Coal: *normal* 400 tons; *maximum* 1000 tons.

Notes.—Slightly exceeded the contract speed on *trial*. Electric hoists are fitted; the 8 in. guns can also be electrically manœuvred. Built at Elswick. Sister *Hai Tien* wrecked 1904.



Hai Yung. (All three identical). Now rigged as plan.

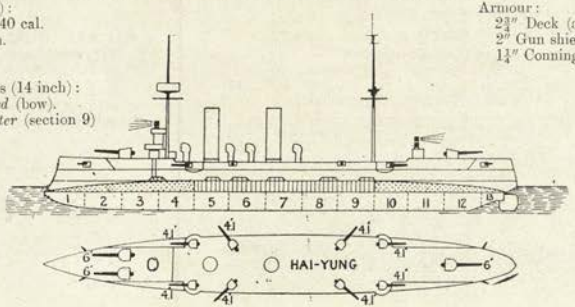
容 海 HAI-YUNG (1897), 籌 海 HAI-CHU (1897) and 探 海 HAI-CHEN (1898).

Displacement, 3000 tons. Complement, 244.

Length, 328 feet. Beam, 41 feet. *Maximum* draught, 16 feet.

Guns (Krupp):
3—6 inch, 40 cal.
8—4·1 inch.
6—1 pdr.
6 Maxims.
Torpedo tubes (14 inch):
1 *submerged* (bow).
2 *above water* (section 9)

Armour:
2¾″ Deck (amidships) = *d*
2″ Gun shields .....
1¼″ Conning tower.....



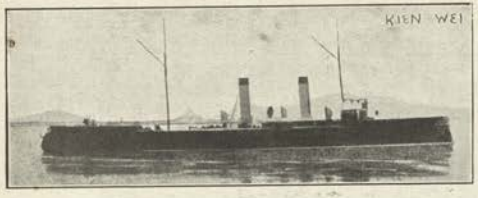
Ahead:
2—6 in.
2—4·7 in.

Astern:
1—6 in.
2—4·7 in.

Machinery: 2 sets triple expansion. 2 screws. Boilers: cylindrical. Designed H.P. 7500 = 19·5 kts. Coal: *normal* 200 tons; *maximum* 500 tons.

Note.—Built by Vulkan Co., Stettin

Torpedo Gunboats.



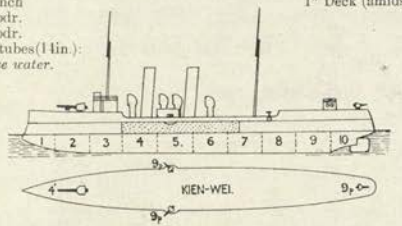
威建 **KIEN-WEI** (1900) and

安建 **KIEN-AN** (1901).

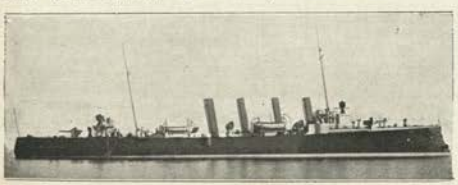
Displacement, 871 tons.

Guns
(Schneider-Canet):
1—4 inch
3—9 pdr.
6—1 pdr.
Torpedo tubes (14 in.):
2 *above water*.

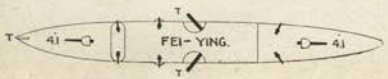
Armour:
1″ Belt (amidships).
1″ Deck (amidships).



Machinery: 2 sets. 2 screws. Boilers: (?) Designed H.P. 7000 = 23 kts. (Machinery, etc., made in France). Coal: 360 tons.



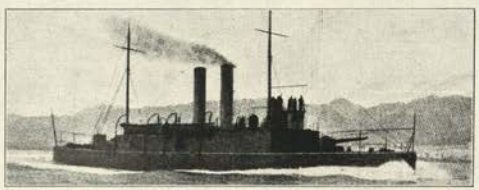
FEI-YING (July, 1897). Displacement, 850 tons. Complement, 90. Guns (Krupp): 2—4·1 inch, 6—6 pdr., 2—1 pdr. Designed H.P. 5500 = 22 kts. Boilers: 8 Yarrow. Coal: 75 tons. Built at Stettin.



Gunboats.

Building.

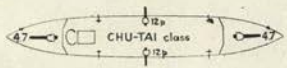
"*A*," "*B*" & "*C*." 1000 tons. Dimensions: 120 × 22 × 5 feet. 14 kts.

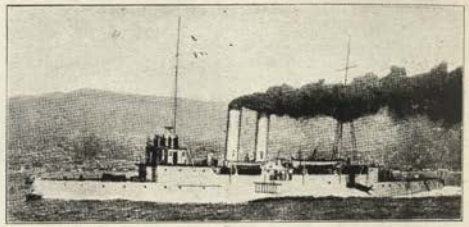


SODO (Kobe, 1907). Speed: 15 kts.

and

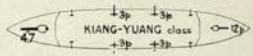
CHU-TAI, CHU-TUNG, CHU-YU, CHU-CHIEN, CHU-YII, CHU-KWAN (Kawasaki Yard, Kobe, 1906-07). 745 tons. Complement, 101. Dimensions: 199½ × 29½ × 8 feet. Armament: 2—4·7, 2—12 pdr., 4 machine. Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: Water-tube. Designed H.P. 1350 = 13 kts. Coal: 150 tons.





KIANG-YUEN, KIANG-HENG, KIANG-LEE, KIANG-CHEN (Kawasaki Yard, Kobe, 1905-06). 565 tons. Complement, 85. Dimensions: 178½ × 28 × 7 feet. Armament: 1—4·7 (bow), 1—12 pdr. (aft), 4—3 pdr., 4 Maxims. Machinery: 2 sets vertical triple expansion. 2 screws. Boilers: water-tube. Designed H.P. 950 = 13 kts. Coal: 100 tons.

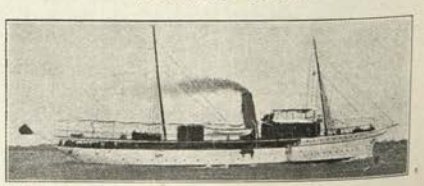
Chiefly employed in policing the Yangtse.



River Gunboat.

——— (Krupp, 1911). Displacement, 140 tons. Armament: 1—24 pdr., howitzer. 2—3 pdr., 2 machine. H.P. 500 = 12 kts. Boilers: 2 Schulz.

Admiralty Yacht.



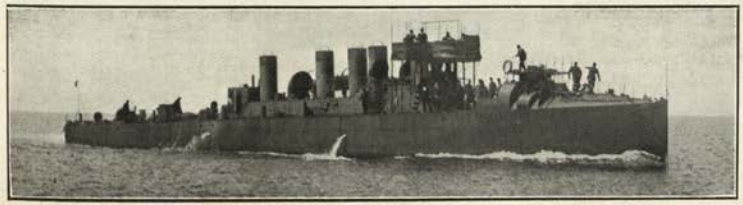
LIEN CHING. (———) ... ... 6 guns. I.H.P. 900 = 14·26 kts. Cylindrical boilers fitted with Howden's *f.d.* Coal: 180 tons.

4 Destroyers.

No.	Type.	Date.	Displacement.	H.P.	*Max.* speed.	Fuel.	Complement.	T. tubes.	*Max.* draug't
			tons		kts.	tons			
3	(S)	'11-'12	400	6000	32	...	...	...	...
1	(ST)	'11-'12							

(S)=Schichau. (ST)=Stabilimento Tecnico.

Also *pro.* or *bldg.* 12 S.T. and 6 S.



1 *Stabilimento Tecnico*: **Lung-Tuan** (1912). 3 *Schichau*: **Fupo, Yen-yun, Chang-yen** (1912). 400 tons. Dimensions: 197×21½× — feet. Armament: 2—12 pdr., 4—3 pdr., 2—18 inch tubes. H.P., 6000=32 kts.

8 Torpedo Boats.

No.	Type	Date	Displacement	H.P.	*Max.* speed	Fuel	Complement	T. tubes	*Max.* draug't
			tons		kts.	tons			feet
	1st class—								
4	*Shen* class (K)	'06-'08	97	1200	23			3	
2	(S)	1897	120	1250	21½	18 *normal*		3	
2	(S)	1897	100	1200	23			3	

(K)=Kawasaki. (S)=Schichau.

(Same as Japanese t. b. of same type.)

4 *Kawasaki* boats, named:—辰 **Shen,** 宿 **Su,** 列 **Nia,** 張 **Tchung.** 97 tons.

Armament: 2–3 pdr. 3 tubes.

SIAMESE SHIPS.

(Revised in Siam).

Arsenal dock: 300 × 45 × 16 feet. 40 ton sheer-leg.
Personnel: 5000. Reserve: 20,000.

New Programme.
1 cruiser *building* at Elswick.

Maha Chakrkri.

Mahut Rajakumar.

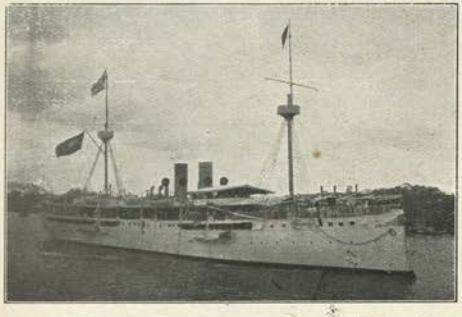
Sriya Monthon.

Bali & Sugrib.

Destroyers.

t.b.

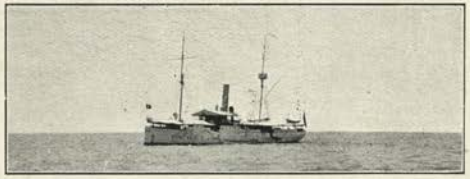
Cruiser.



Photo, Mrs. A. Frege

MAHA CHAKRKRI (1892). 3000 tons. Guns: 4—4·7 inch, 10—6 pdr., 6 machine. Armour: 2″ steel deck. Designed H.P. 3000 = 14 kts. Coal: 280 tons.

Gunboats.



Photo, Mrs. A. Frege.

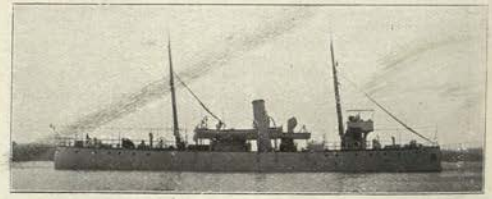
BHALI (1901), **SUKRIB** (1901) & **MURATHIA** (1898). 580-530 tons. Guns: 1—4·7 inch, 5—6 pdr., 4—1 pdr. Designed H.P. 500 = 12 kts.

1 funnel, 2 masts.

See Silhouettes.

MAHUT RAJAKUMAR (*ex Filipinas*) (1887). 700 tons. Guns: 2—old 4·7 inch, 4—6 pdr., 3—1 pdr. 1 tube. Original speed: 14 kts. (11·5).

Custom Cruisers.



SRIYA MONTHON (Thornycroft, 1908). Guns: 1—6 pdr. Designed H.P. 700 = 14·5 kts.

Transport.

BUK. 850 tons. 10 kts.

Also 10 steamers and 50 to 60 river gunboats and launches of or under 100 tons.

1 + 2 Destroyers.

4 funnels, same as Japanese.

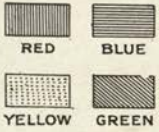
Sua-Tayaru-Schol (1908), *B* and *C building*. 375 tons. Armament: 1—12 pdr., 5—6 pdr., 2 Maxims, 2—18 inch tubes. H.P. 6000 = 27 kts. Dimensions: 227 × 21½ × 6 feet.

3 Torpedo Boats.

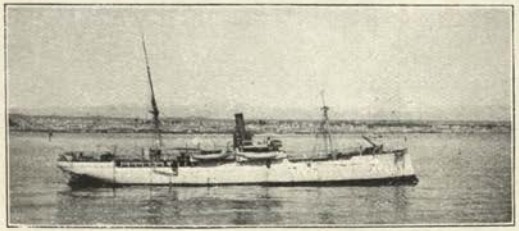
2 funnels, Japanese type.

Kawasaki boats:—No. ***1, 2*** and ***3*** (1908). 120 tons. Armament: 1—6 pdr., 1—2½ pdr., 2—18 inch tubes. Speed: 22 kts

PERSIAN.



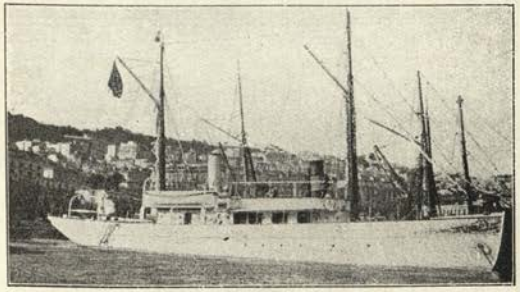
Gunboat.



Photo, Lieut. Frewin, R.N.

PERSEPOLIS (1885). 600 tons. Nominal speed: 10·5 kts.

Imperial Yacht.



SELIKA (1902). 400 tons.

Photo wanted.

MUZALFARI (purchased 1903). 379 tons. Dimensions: 130×26×13 feet. Guns: 2—3 pdr. Hotchkiss and several small.

SARAWAK.

Paddle steamer.

ADEH (1884). 300 tons. 1 gun.

1 funnel, 2 masted schooner.

LORNA DOONE (1881). 118 tons. 2 guns.

1 funnel, 2 masts.

ALINE (1875). 175 tons. 2 guns.

EGYPT.

Revised by (H. F. S.)

ENSIGN & JACK.

KHEDIVIAL STANDARD

Red

White

ABDUL MONEIM.

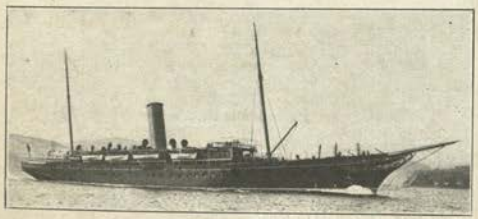
MAHROUSSA.

ABBAS.

NOUR-EL-BAHR.

RESCHID.

Khedive's Yacht.



MAHROUSSA (1865) (1906). 3417 tons. Parsons turbine. H.P. 5500 = 17·5 kts. Now painted white, yellow upperworks.

Customs Cruisers.

ABDUL MONEIM (Clydebank, 1902). 598 tons. Guns: 1—3 pdr. H.P. 1000 = 13 kts.

ABBAS (1891). 298 tons. Guns: 1—3 pdr. H.P. 650 = 13 kts.

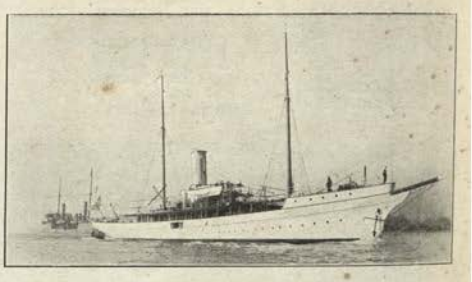
NOUR-EL-BAHR (1884). 450 tons. Guns: 1—3 pdr. H.P. 870 = 13·5 kts.

RESCHID. About 650 tons. Guns: 2—6 pdr.

Ports and Lights Administration.

AIDA. 723 tons. 1 gun. H.P. 130 = ?

LIBERIA.



LARK (*ex Eros*) (1876). 770 tons.

MOROCCO.

TURKI (1898). 450 tons. Guns: 2—12 pdr. Field. *Maximum* speed: 12·5 kts.

1 funnel, 3 masts.

EL HASSANEH (1882). 1164 tons. Guns: 1 old 6 inch, 4 machine. *Nominal* speed: 10 kts.

PART II.

THE PROGRESS OF WARSHIP ENGINEERING.

By C. de Grave Sells, M. Inst., C.E.

THE best method to realize the exact amount of progress made in any particular direction is to look back over a definite period, and to see what change has been brought about from the conditions that then existed.

This year offers an admirable opportunity for such a looking back, for it is exactly one hundred years since the advent of the first warship propelled by steam, and the history of this vessel is so interesting and her design and construction at that day marked such a great step in progress, that it is well to place on record not only the particulars of the vessel herself, but also the circumstances of her construction.

And this immense step in progress was brought about, not by the official naval constructors of an old-established sea power with the experience of centuries at its back, but by a civilian of a comparatively new power, and it is, therefore, justly, that the Department of the Navy of the United States of America look upon it as a matter for much pride that the first steamer for war purposes in any Navy of the World was designed and built by a "most ingenious and enterprizing citizen" of the United States, and that she was a worthy progenitor of what is to-day one of the most powerful war navies of the world.

It was towards the close of the year 1813 that Robert Fulton (born in 1765) exhibited to the President of the United States the drawing of a proposed war steamer or floating battery, named by him the "Demologus." This design is shown in Fig. 1, and is reproduced from the original drawing in the possession of the Bureau of Construction and Repair at the Navy Department, Washington, by the kindness of the Secretary of the U. S. Navy.

The upper view is a section of the vessel, and bears the explanatory notes:—"A her boiler. B the engine. C the water-wheel. DD gun deck. EE her wooden walls 5 feet thick diminishing to below the water line as at FF, draught of water 9 feet."

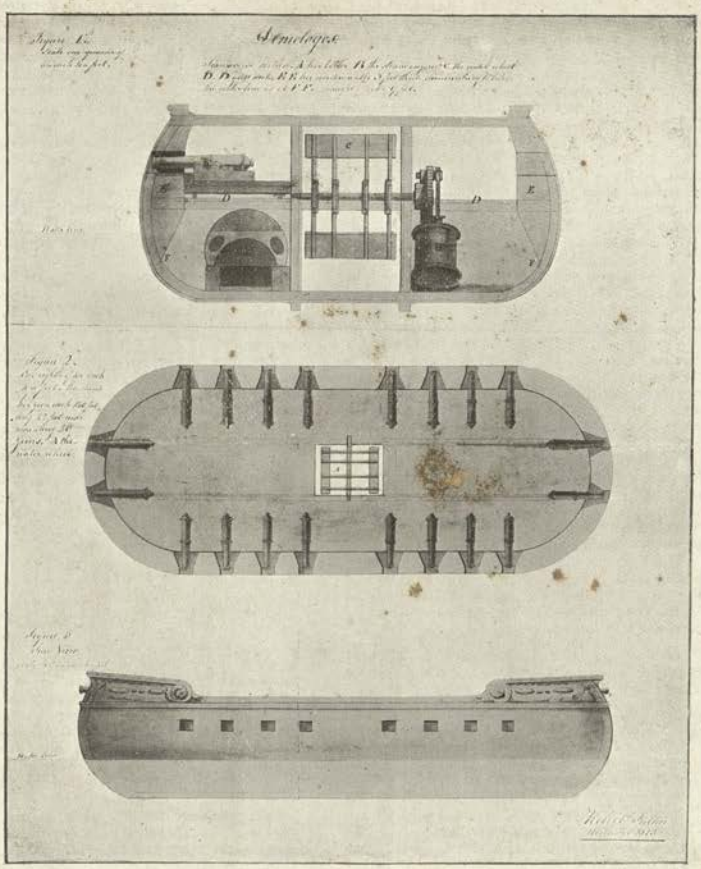


Fig. 1

THE FIRST WARSHIP PROPELLED BY STEAM.
UNITED STATES WARSHIP "DEMOLOGOS," 1814.
From the Original Drawing by Robert Fulton in the Navy Department, Washington

The second view is a plan of the gun deck, and the explanatory note is as follows:—"This shows her gun deck 140 feet long, 42 feet wide, mounting 20 guns. A the water wheel," and in the right hand bottom corner is the signature, "Robert Fulton, November, 1813."

The designer contemplated in addition to the armament shown, that she should be "furnished with four submarine guns, two suspended at each end, to discharge a hundred-pound ball into an enemy ten or twelve feet below her water-line," and that she should also "have an engine for throwing an immense column of hot water upon the decks or through the ports of an opponent." The total estimated cost was three hundred and twenty thousand dollars, which was about the cost of a first-class sailing frigate.

Fulton's project was favourably received, and in March, 1814, a law authorized the President to cause to be equipped "one or more floating batteries for the defence of the waters of the United States."

The construction of the vessel was to be carried out under the direction of a committee of five gentlemen, appointed by William Jones, Secretary of the Navy.

Robert Fulton, whose soul animated the enterprise, was appointed engineer and on the 20th of June, 1814, the keels were laid at New York. The coast at that time was being blockaded so that the importation of copper, lead, and iron, and the supply of coal was rendered very difficult; but all these obstacles were overcome, and the effect of the blockade was merely to increase the expense of construction. With respect to the supply of mechanics and labourers there was also much difficulty, as the shipwrights had emigrated to the lakes in such numbers that comparatively few were left on the sea board while a large number had enlisted as soldiers. However, by offering considerable inducements as to wages a sufficient number of workmen were obtained, and the vessel was finally launched on the 29th of October, 1814.

A description of the event given by Rear-Admiral G. H. Preble, U.S.N., in his "History of Steam Navigation" states that the launch took place "amidst the hurrahs of assembled thousands. The river and bay were filled with steamers and vessels of war in compliment to the occasion. In the midst of these was the floating mass of the "Demologus," whose

bulk and unwieldy form seemed to render her as unfit for motion as the land batteries which were saluting her."

Commodore David Porter who had been appointed to the command of the vessel, in his report to the Secretary of the Navy wrote as follows:—

"I have the pleasure to inform you that "the Demologus" was this morning safely launched. No one has as yet ventured to suggest any improvement that could be made in the vessel, and to use the words of the projector "I would not allow it if it were in my power to do so." She promises fair to meet our most sanguine expectations, and I do not despair in being able to navigate her from one extreme of the coast to the other. Her buoyancy astonishes every one. She now draws only eight feet three inches of water, and her draught will be ten feet, with all her guns, machinery, stores, and crew on board. The ease with which she can now be towed by a single steamboat renders it certain that her velocity will be sufficiently great to answer every purpose, and the manner it is intended to secure her machinery from the gunners' shot leaves no apprehension for its safety. I shall use every exertion to prepare her for immediate service. Her guns will soon be mounted, and I am assured by Mr. Fulton that her machinery will be in operation in about six weeks."

After the launch the vessel was towed to the works of Robert Fulton on the North River to receive her machinery.

The actual dimensions of the "Demologus" were as follows :—

Length	150 ft.
Beam	56 ft.
Depth	20 ft.
Water-wheel, diameter	16 ft.
,, length of bucket.	14 ft.
,, dip of do.	4 ft.
Engines, dia. of cylinder	48 ins.
,, stroke	5 ft.
Boiler, length	22 ft.
,, breadth	12 ft.
,, height	8 ft.

The displacement of the vessel was 2475 tons and she was the largest steamer by many hundreds of tons that had been built at the date of her launch.

The complete vessel with her hull and machinery were designed by Fulton himself, and the engines and boilers were built at his machine works on the Hudson River and under his own supervision, and the more the details of his enterprise come to light, the more one is forced to admire the genius and foresight of her designer, who, a century ago, realized so fully the needs of an all-conquering warship, with her propelling machinery and vital parts well protected, all-round fire, adequate protection for the guns, and means of under-water attack; and so effectually carried out his plans to meet them.

As is stated above, the Commissioners met with considerable difficulties in the completion of the vessel but the greatest of all was the death of Robert Fulton himself which took place before the vessel was finished. However, no serious delay took place, and the designs he had had prepared so carefully were finally carried to completion and the "Demologus" was taken out for a preliminary steam trial which proved a success. The official trial took place just a month later when she made a trip under steam to the sea, beyond Sandy Hook and back again, a distance of 53 miles in 8½ hours. A satisfactory firing trial took place about two months later, when with her guns, ammunition and a considerable amount of stores on board she was found to have a draught of somewhat under 9 ft.

The writer is also indebted to the Secretary of the U. S. Navy for the "Official Report of the Commissioners" from the archives of the U. S. Navy and which will be found to be of considerable interest.

"Report of the Commissioners Superintending the Construction of a Steam Vessel-of-War to the Secretary of the Navy."

"The war which was terminated by the treaty of Ghent afforded, during its short continuance, a glorious display of the valour of the United States, both by land and sea. It made them better known to foreign nations, and, what is of much greater importance, it contributed to make them better acquainted with themselves—it excited new enterprises—it educed latent talents—it stimulated to exertions unknown to our people before. A long extent of coast was exposed to an enemy powerful above every other on the ocean. His commanders threatened to lay waste our country with fire and sword, and actually, in various instances, carried their menaces into execution. It became necessary for our defence, to resist, by every practicable method, such a formidable foe.

It was conceived by a most ingenious and enterprising citizen, that the power of steam could be employed in propelling a floating battery, carrying heavy guns, to the destruction of any hostile force that should hover on the shores, or enter the ports of our Atlantic frontiers. The perfect and admirable success of his project for moving boats containing travellers and baggage by the same elastic agent, opened the way to its employment for carrying warriors and the apparatus for fighting.

The plan was submitted to the consideration of the Executive of an enlightened Government. Congress, influenced by the most liberal and patriotic spirit, appropriated money for the experiment; and the Navy Department, then conducted by the Hon. William Jones, appointed commissioners to superintend the construction of a convenient vessel, under the direction of Robert Fulton, Esq., the inventor, as engineer, and Messrs. Adam and Noah Brown as naval constructors.

The keels of this steam frigate were laid on the 20th day of June, 1814. The strictest blockade the enemy could enforce interrupted the coasting trade, and greatly enhanced the price of timber. The vigilance with which he guarded our coast against intercourse with foreign nations, rendered difficult the importation of copper and iron. The same impediment attended the supplies of coal, heretofore brought to New York from Richmond and Liverpool. Lead, in like manner, was procured under additional disadvantages. These attempts of the enemy to frustrate the design were vain and impotent. All the obstacles were surmounted. Scarcity of the necessary woods and metals were overcome by strenuous exertions; and all the blockading squadron could achieve was, not a disappointment in the undertaking but merely an increase of the expense.

So, in respect to tradesmen and labourers there was an extraordinary difficulty. Shipwrights had repaired to the lakes, for repelling the enemy, in such numbers that comparatively few were left on the seaboard A large proportion of the men who had been engaged in daily work had enlisted as soldiers, and had marched under the banners of the nation to the defence of its rights. Yet, amidst the scarcity of hands, a sufficient number was procured for the purpose which the commissioners had in charge. An increase of wages was the chief impediment, and this they were enabled practically to overcome.

By the exemplary combination of diligence and skill on the part of Mr. Fulton and the constructors, the business was so accelerated that the vessel was launched on the 29th day of October, amidst the plaudits of an unusual number of citizens.

Measures were immediately taken to complete her equipment: the boilers, the engine, and the machinery were put on board with all possible expedition. Their weight and size far surpassed anything that had been witnessed before among us. The stores of artillery of New York not furnishing the number and kind of cannon which she was destined to carry, it became necessary to transport guns from Philadelphia. A prize taken from the enemy put some fit and excellent pieces at the disposition of the Navy Department. To avoid the danger of capture by the enemy's cruisers, they were carted over the miry roads of New Jersey. Twenty heavy cannons were thus conveyed by strength of horses though the performance was attended with a proportionate expense. Carriages of the most approved model were constructed, and everything was done to bring her into prompt action as an efficient instrument of war.

About this time an officer, pre-eminent for bravery and discipline (Commodore Porter) was commissioned by the Government to her command. She is finished conformably to the plan submitted to the Executive. She is a structure resting on two boats and keels, separated from end to end by a canal fifteen feet wide, and one hundred and fifty-six feet long. One boat contains the capacious cauldrons of copper

to prepare her steam. The vast cylinder of iron, with its pistons, levers and wheels, occupies a part of its fellow. The great water-wheel revolves in the space between them. The main or gun-deck supported her armament, and was protected by a bulwark four feet ten inches thick, of solid timber; this is pierced by thirty port-holes, to enable as many 32-pounders to fire red-hot balls. With the expectation of being able to raise the blockade of New London, by destroying, taking, or routing the enemy's ships, and, under the opinion of Mr. Fulton and Commodore Porter, the following additions were incorporated with the vessel, viz.: her upper or spar deck is surrounded by a bulwark and stanchions, two stout masts are erected to support lateen-sails and two bowsprits for jibs, and a corresponding rigging.

It must be observed that under the exhaustion of the treasury and the temporary depression of public credit, the commissioners were exceedingly embarrassed; their payments were made in treasury notes, which they were positively instructed to negotiate at par. On several occasions even these were so long withheld that the persons who had furnished labour and materials for the vessel were importunate for payment, or silently discontented. To a certain extent, the commissioners pledged their private credit. The men actually broke off, notwithstanding all this, at one time: the work was retarded and her completion unavoidably deferred to the great disappointment of the commissioners, until winter rendered it impossible for her to act.

Under all this pressure, they persevered in the great object confided to them. Their exertions, however, were retarded by the premature and unexpected death of Mr. Fulton. The world was deprived of his invaluable labours before he had completed this favourite undertaking. We will not inquire wherefore, in the dispensation of Divine Providence, he was not permitted to behold his grand conception realized. But his discoveries survive for the benefit of mankind, and will extend to unborn generations.

At length all matters were prepared for a trial of the machinery to urge such an extraordinary vessel through the water. This essay was made on the 1st day of June 1815; she proved herself capable of opposing the wind and of steaming the tide, of crossing currents, and of being steered among vessels lying at anchor, though the weather was boisterous and the water rough. Her performance demonstrated that the project was successful; no doubt was entertained on the principal subject that a floating battery, carrying heavy cannon, could be moved by steam. The commissioners returned from the exercise of the day satisfied that the vessel would answer the intended purpose, and consoled themselves that their care had been bestowed upon a worthy object. She was prepared for a second voyage with all convenient speed. On the 4th day of July, the vessel was ready for a second trial. She performed a trip to the sea, eastward of Sandy Hook and back again, a distance of fifty-three miles, in eight hours and twenty-six minutes: a part of this time she had the tide against her, and had no assistance whatever from sails. Of the gentlemen, civil and military, who formed the company invited to witness the experiment, not one entertained a doubt of her fitness for her intended purpose.

These arrangements having been made, a third trial of her powers was attempted on the 11th day of September, with the weight of twenty-six of her long and ponderous guns, and a considerable quantity of ammunition and stores on board; her draught of water was short of eleven feet. She changed her course by inverting the motion of the wheel, without the necessity of putting about. She fired salutes as she passed the ports, and she overcame the resistance of the wind and tide in her progress down the bay. She performed beautiful manœuvres around the United States frigate "Java" then at anchor near the lighthouse. She moved with remarkable celerity, and she was perfectly obedient to her double helm. It was observed that the explosion of powder produced very little concussion. The machinery was not affected by it in the smallest degree. Her progress during the firing was steady and uninterrupted. On the most accurate calculations, derived from heaving the log, her average velocity was five miles and a half per hour. Notwithstanding the resistance of currents, she was found to make headway at the rate of two miles an hour against the ebb of the East River, running three and a half knots. The day's exercise was satisfactory to the respectable company who attended beyond their utmost expectations. It was universally agreed that we now possessed a new auxiliary against every maritime invader.

The city of New York, exposed as it is, was now considered as having the means of rendering itself invulnerable. The Delaware, Chesapeake, Long Island Sound, and every other bay and harbour in the nation, may be protected by the same tremendous power.

Among the inconveniences observable during the experiment, was the heat endured by the men who attended the fires. To enable a correct judgment to be formed on this point, one of the commissioners (Dr. Mitchell) descended and examined by a thermometer the temperature of the hold between the two boilers. The quicksilver, exposed to the radiant heat of the burning fuel, rose to one hundred and sixteen degrees Fahrenheit's scale. Though exposed thus to its intensity, he experienced no indisposition afterwards. The analogy of the potteries, forges, glass-houses, kitchens, and other places where labourers are habitually exposed to high heats, is familiar to persons of business and reflection. In all such occupations, the men, by proper relays, perform their services perfectly well.

The government however will understand that the whole of the present vessel could be rendered cooler by other apertures for the admission of air; and that, on building another steam frigate, the comfort of the firemen might be provided for as in the ordinary steamboat.

The commissioners congratulate the Government and the nation on the event of this noble project. Honourable alike to its authors and its patrons, it constitutes an era in warfare and the arts. The arrival of peace, indeed, had disappointed the expectations of conducting her to battle; that last and conclusive act of showing her superiority in combat, it has not been in the power of the commissioners to make.

If a continuance of tranquility should be our lot, and this steam vessel of war be not required for the public defence, the nation may rejoice that the fact we have ascertained is of incalculably greater value than the expenditure, and that if the present structure should perish, we have the information never to perish, how, on a future emergency, others may be built. The requisite variations will be dictated by circumstances.

Owing to the cessation of hostilities, it has been deemed inexpedient to finish and equip her as for immediate and active employ. In a few weeks everything that is incomplete could receive the proper adjustment.

After so much has been done and with such encouraging results, it becomes the commissioners to recommend that the steam frigate be officered and manned for discipline and practice. A discreet commander, with a select crew would acquire experience in the mode of navigating this peculiar vessel. The supplies of fuel, the tending of the fire, the replenishing of the expended water, the management of the mechanism, the heating of shot, the exercise of the guns, and various other matters, can only become familiar by use. It is highly important that a portion of seamen and marines should be versed in the order and economy of the steam frigate. They will augment, diffuse, and perpetuate knowledge. When in process of time another war shall call for more structures of this kind, men regularly trained by her tactics may be dispatched to the several stations where they may be wanted.

It is hoped these communications will evince the pains taken by the commissioners to execute the honourable and responsible trust reposed in them by the Government."

It may be well believed that the construction of this wonderful vessel was followed with great interest in Great Britain and extraordinary rumours were current of what she would be able to do. A good example appeared in the "*Edinburgh Evening Courant*, of Thursday, August 31st, 1815, the writer of

which states that he had been at much pains to procure "full and accurate information" and gives the following particulars of the "steam frigate" at New York.

"Length of deck 300 feet; breadth 200 feet, thickness of her sides 13 feet of alternate oak plank and cork wood; carries 44 guns, four of which are 100 pounders; waist guns 60 pounders, quarter deck and forecastle guns 42 pounders, and further to annoy the enemy attempting to board can discharge 100 gallons of boiling water in a minute, and by mechanism brandishes three hundred cutlasses with the utmost regularity over her gunwales, works also an equal number of heavy iron pikes of great length, darting them from her sides with prodigious force, and withdrawing the same every quarter of a minute."

Towards the end of 1814 as the "Demologus" seemed so thoroughly efficient and to promise such an effectual protection for New York and the River Hudson it was proposed to construct a similar vessel for the protection of Philadelphia and the Delaware River and her dimensions were to be as follows:—

Length	167 feet
Beam	56 feet
Depth of hull	12 feet
Thickness of sides ...	5 feet
Power	120 horses

The time for building her was given as seven months, and the estimate for the hull and engines was given as 150,000 dollars.

In Fulton's letter to Philadelphia with particulars of the proposed vessel he says that the boilers of copper would weigh 24 tons, and all the valves and communication in contact with salt water would be of brass. She was to be pierced for thirty guns long 32-pounders and was to have a speed of 4½ to 5 miles an hour in still water. The above estimate of cost was independent of guns, coppering, sails, anchors, cordage, joiners' work, and armament in general, and all complete, the cost was estimated at 240,000 dollars.

It was proposed to build the hull at Philadelphia and make the principal part of the machinery at New York, but the cessation of hostilities with Great Britain caused the proposed construction of the second vessel to be abandoned.

The "Demologus" herself was renamed the "Fulton" after her designer, and the immediate need of her services having ceased with the termination of the war, she was taken to the Navy Yard at Brooklyn and adopted for use as a receiving ship. She served for this purpose until the 4th of June 1829, when she was accidentally blown up owing to gross carelessness, causing the death of 25 persons and many were wounded. Commodore Chauncey in his report of the catastrophe says the destruction of the ship was complete and entire.]

The British Admiralty had followed with close attention the construction of this famous vessel and in 1815 a steam sloop was laid down in Chatham Dockyard, but she was eventually launched as a sailing vessel, and it was some years before another steam war-vessel was actually completed.

During the half century following the advent of the "Demologus" great changes were realized. Steam engines became universally adopted in war-vessels and the screw propeller displaced the paddle-wheel for their propulsion, until just 50 years after another notable step in progress was taken by the adoption of twin screws, each driven by an independent engine.

The first application of this principle had been made by Messrs. J. & W. Dudgeon in an iron vessel 150 ft. long named the "Flora" to the trials of which the British Admiralty sent their representatives, and the results were judged so satisfactory that just 50 years ago the first war-vessel propelled by twin screws driven by independent engines was built for the British Navy.

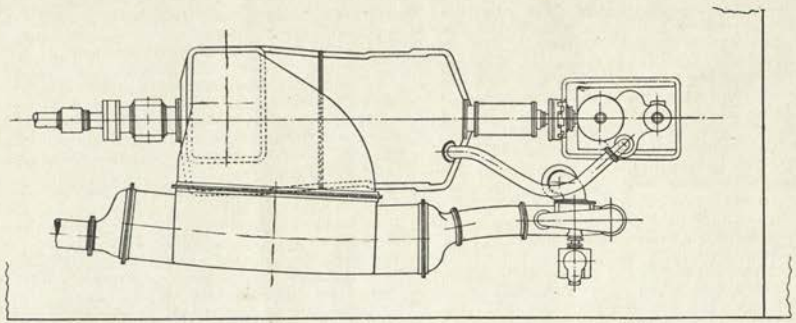


Fig. 2.

Arrangement of Machinery. T. B. Destroyer "Henley."
Fore River Shipbuilding Co., Quincy, Mass.
United States Navy.

PROPELLING ENGINES FOR CRUISING.

Turning now to modern machinery, one of the special problems connected with the design of the propelling machinery for destroyers fitted with turbine engines has proved to be the difficulties arising from having to provide special machinery for cruising speeds, so as to attain a maximum radius of action as economically as possible. And a solution of this problem has become even more indispensable since it has been decided to adopt the destroyer also for scouting work, in place of the small fast cruisers known as scouts.

In some vessels it has been decided to adopt oil engines for this purpose, but it is now generally considered that in war-time this will prove a mistake, for actually in service or on scouting duties, the vessel must be ready to go at full speed at very short notice, so that the boilers will have to be kept under steam ready for such an emergency, and in that case steam may as well be used also for the cruising engines.

Accordingly in the latest destroyers of the United States navy, reciprocating engines have been fitted for use at cruising speeds, the first one of this class being the "Henley," constructed by the Fore River Shipbuilding Co. at Quincy, Mass.

The vessel and her boilers are identical with those of the "Perkins" and "Sterrett" constructed by the same builders to the same designs, the only difference being in the propelling machinery, the arrangement of which is shown in Fig. 2.

The turbines are of the Curtis type having 18 stages with a pitch diameter of 63 inches, and very similar to those fitted in the sister vessels (*). There are 18 ahead stages with 42 rows of buckets and 2 stages for going astern with 8 rows of buckets.

The designed S.H.P. of the main turbines is 11,000 with 585 revolutions, which should give the vessel a speed of 29½ knots on a four hours' trial in the open sea.

The cruising engines are situated at the forward end of the turbine engines, and connected to the main shaft by a disconnecting clutch of the ordinary type. They are compound reciprocating engines, the dimensions being H.P. Cyl. 10½ ins. diameter, L.P. Cyl. 22 ins. diameter with a stroke of 10 ins. These engines are constructed to develop 400 H.P. each at 280 revolutions per minute with a steam pressure of 250 lbs. per sq. inch and exhausting into the turbines at slightly over atmospheric pressure.

There are four boilers of the Yarrow type having a total collective surface of 18,000 sq. ft. and the boilers are fitted for burning oil-fuel exclusively, each boiler having seven fuel burners.

* See "Fighting Ships," 1912, page 510.

Besides the full power trial, a four hours trial was run at 25 knots and a cruising trial at 16 knots and of the duration of 10 hours. The first two trials were carried out with the turbine engines, only the reciprocating engines being disconnected, but for the official cruising trial at 16 knots, the steam passes direct to the reciprocating engines, which exhaust into the main turbines.

In addition to these official trials, a special trial of two hours' duration was made at cruising speed, using 3 cruising nozzles of the main turbines and without the reciprocating engines. This trial proved very valuable for the purposes of comparison and the results are given in the last column of the table below.

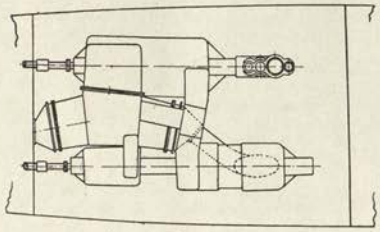


Fig. 3.

ARRANGEMENT OF MACHINERY.
T. B. DESTROYERS "CASSIN" AND "CUMMINGS."
BATH IRON WORKS, LTD., BATH, MAINE.
UNITED STATES NAVY.

being designed to develop 16,000 collective S.H.P. at full speed giving the vessel a speed of 29 knots.

The vessels and their machinery were constructed by the Bath Iron Works Ltd. at Bath, Me., and their leading dimensions are as follows :—

Length	300 ft.
Beam	30 ft. 3 ins.
Draft	9 ft. 3 ins.
Displacement	1010 tons.

The engines are arranged on two lines of shafting, the main H.P. turbine and a separate astern turbine being fitted on the starboard shaft, while the L.P. turbine with an astern turbine incorporated in the after end of its casing is fitted on the port shaft. Forward of this is the reciprocating engine for cruising which is fitted with a clutch coupling for disconnecting it from the turbine shaft when not in use.

When running at full speed the steam passes direct into the H.P. turbine, then into the L.P. turbine and so to the condenser, the astern turbines revolving in a vacuum.

For high cruising speeds, two cruising stages are provided in the H.P. turbine to which the steam is conveyed direct, and thence through the main engines as before.

For low cruising speeds, the steam passes first to the reciprocating engine from which it goes to the cruising turbine, and then on as before. After leaving the reciprocating engine it passes through a re-heater which is found to greatly improve the economy of the engine. For going astern, the astern turbines only are used.

The diameters of the rotors are as follows:—H.P. 48 ins., L.P. 60 ins., cruising turbine 46 ins., and astern turbines 44 ins. The length of blading in the H.P. turbine varies from $1\frac{1}{16}$ inch to 6 ins. and that of the L.P. turbine from 5 ins. to $10\frac{1}{2}$ ins.

	Full Speed.			25 Knot Trials.			16 Knot Trials.			
	Perkins	Sterrett	Henley	Perkins	Sterrett	Henley	Perkins	Sterrett	Henley	Henley
Steam Pressure in lbs.	257	263	244.8	260	263	259	258	264.5	263.5	258.4
Vacuum in ins.	27.8	27.3	27.9	28.2	28.8	28.8	28.2	28	28.7	28.6
Mean Revolutions	593.5	631.2	641.8	479.7	489.5	479.4	301.1	298.2	291.3	292.9
Air Pressure in Boiler Rooms—ins.	2.4	3.3	4.9	2.1	3.6	3.8	1.2	1.4	2.16	2.67
Total S.H.P.	11668	12789	13472	6485	6765	3693	1544	1596	1299	1367
I.H.P. of Reciprocating Engines	—	—	—	—	—	—	—	—	713	—
Speed of Vessel—knots	29.76	30.37	30.41	25.2	25.22	25	16.61	16.27	15.97	16

On the official trials of the "Henley" the displacement was slightly greater than in the case of the sister vessels so that on the full speed trial the revolutions and power developed were rather higher. The contractors had guaranteed at the cruising speed of 16 knots that there should be an economy of 25 per cent. over the performances of the turbines only when running under similar conditions and with a steam pressure of 250 lbs. per sq. inch, but at a series of shop trials made with the starboard engines before they were fitted on board it was found that there was a marked improvement in economy of steam consumption amounting to 33 per cent at the normal cruising speed of 16 knots, the improvement increasing still further as the speed was diminished.

Another type of machinery is shewn in Fig. 3 which represents the arrangement of the propelling engines in the destroyers "Cassin" and "Cummings," which form part of a set of eight vessels numbered 43 to 50 for the United States navy.

These also are twin screw vessels, and they are fitted with a combination of turbine engines of the Parsons type, with a reciprocating engine for cruising speeds, the former

The reciprocating engine is of the compound type with cylinders H.P. 16 ins. diameter and L.P. 24 ins. diameter with a stroke of 18 ins.

The main condenser is situated on the centre line of the vessel between the two turbines and is fitted with curved tubes which are expanded in both tube plates. These are also curved to a radius of 95 ins., so as to obtain the necessary rigidity. The diameter is 6 ft. 4 ins. and it is fitted with 4320 tubes with a cooling surface of 10,800 sq. ft. A Parsons vacuum augmenter is fitted of 24 ins. diameter and containing 277 $\frac{5}{8}$ inch tubes having a cooling surface of 253 sq. ft.

The boilers are shewn in Fig. 4 and are of the Normand type, four in number, arranged in two compartments. The working pressure is 260 lbs. per sq. inch. Each boiler has 1594 tubes of 1¼ ins. diameter, and 116 tubes of 1½ ins. diameter, the total heating surface of the 1710 tubes being 5375 c. sq. ft. There are 12 oil-fuel burners of the new type of the U. S. Navy to each boiler.

In each boiler room there are two forced draught fans of the Keith type, 39 ins. in diameter, driven by Terry turbines 24 ins. in diameter. These are arranged with the shaft vertical and are fixed at the bottom of the downtake air trunks in the method which is now becoming general in most destroyers(*).

The specification called for the following trials :—

A.—A progressive trial from 12 knots upwards to the full speed of 29 knots.

B.—A full speed trial of four hours with an average speed of not less than 29 knots.

C.—A consumption trial of four hours under service conditions at 24 knots.

D.—A trial of four hours at the cruising speed of 15½ knots with the reciprocating engine in use to ascertain the consumption of oil-fuel, and this was to be followed by

E.—A trial under similar conditions of 24 hours duration in the open sea, and finally

F.—A further consumption trial of four hours' duration at 12 knots.

The trials of both vessels were very successful, the full speed in each case being easily obtained and the most interesting particulars of the trials of the "Cummings" are as follows :—

On trials B and C the high and low pressure turbines only were in use, and on trials D and F the steam was taken direct to the reciprocating engine, from which it exhausted into the H.P. turbine, then passing through the L.P. turbine to the condenser.

THE ZOELLY TURBINE.

This type of turbine has been steadily gaining in favour for use in war vessels and the result of the recent installations in the Italian navy has been very satisfactory.

It was in 1903 that the first stationary engine of this type of turbine was constructed for commercial use after many years' designing and testing, and the type of this first installation has been maintained to the present day.* Shortly afterwards the first marine turbine of this type was constructed, which differed somewhat in principle from the stationary type, but embodied most of its constructionary details. Mr. Zoelly adopted the compound type as the best arrangement for marine use, with impulse wheels in the high pressure portion and the usual drum for the low pressure part, as by this combination the best possible efficiency is obtained with the minimum number of blade rows, and he so arranged the exact number of stages in the two parts that the resulting axial thrust, that is the steam pressure on the drum minus the propeller thrust, might easily be taken by the thrust bearing without the necessity of a balance disc.

Trial.	B.	C.	D.	F.
Steam pressure, in lbs.	251.1	193.2	205.9	115.6
Vacuum in inches	28.5	29.1	27.6	27.8
Mean revolutions	615.79	420.95	256.07	196.31
Shaft H.P.	18.295	7.246	1961	931
Mean speed, in knots	30.57	23.99	15.47	11.95
Mean slip per cent.	24.5	13.35	7.94	6.95
Boilers in use	4	4	1	1
Burners in use	48	19	6	4
Lbs. of oil per hour	18284	7965	2354	1340
Evaporation per lb. of oil	13.16	13.82	14.24	14.78
Lbs. oil per S.H.P.	.999	1.099	1.199	1.44
Lbs. water per S.H.P.	13.15	15.19	17.09	21.28

* See "Fighting Ships," 1911, page 502

*See "Fighting Ships," 1905, page 414.

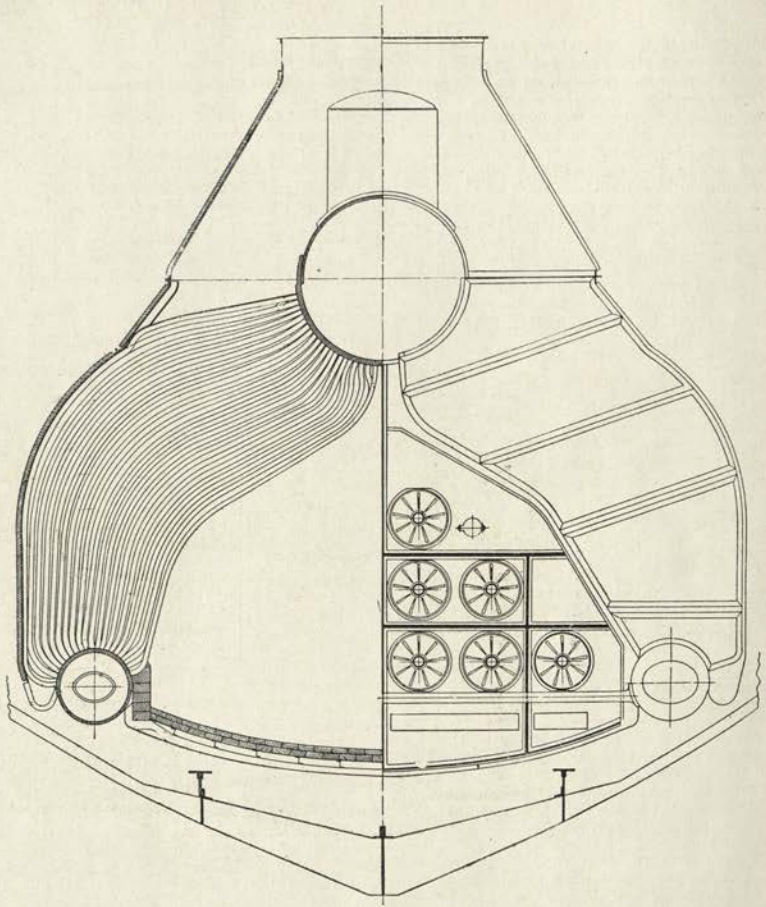


Fig. 4.

Boilers of Normand Type for Liquid Fuel.

T. B. Destroyers "Cassin" and "Cummings."

Bath Iron Works, Ltd., Bath, Maine.

United States Navy.

The result of the installation in the Italian navy has been followed with much interest. The Ministry of Marine had ordered four t.b. destroyers of 680 tons displacement from Messrs. Orlando Fratelli, of Leghorn, and the original idea was that they should be of the Thornycroft type with Parsons turbines and identical with those built at Naples by Messrs. C. & T. T. Pattison. Messrs. Orlando however were able to induce the Minister to allow them to build two of the four boats entirely to their own designs, assuming full responsibility for the results, and by which they have been abundantly justified.

Messrs. Orlando being the holders of the patent rights of the Zoelly type of turbine in Italy, decided to instal this type with White-Forster boilers in two vessels, while the other two were to have Parsons turbines and boilers of the Thornycroft type.

The turbine itself is shewn in Fig. 5 and it will be seen that one casing contains both the ahead and astern turbines. A special feature is the use of cruising stages which allow of the efficient use of the steam at cruising speeds, the steam expanding from boiler pressure down to about atmospheric pressure.

As shewn in the illustration, each turbine has 12 compound stages, each having two rows of blades of a mean diameter of 4 ft. 11 ins., and the last of these wheels is fitted on the drum itself which has 21 stages of the same diameter. The astern turbine has two compound wheels and three stages on the drum.

The turbine shaft is of forged steel carefully annealed before finishing and is bored out for its entire length. It is made in one piece and so avoids all the troubles caused in the case of combined rotor shafts from the loosening due to the continuous variations of temperature and load. The runner wheels are also of steel forged in one piece together with the bosses and rims and these also are carefully annealed before finishing.

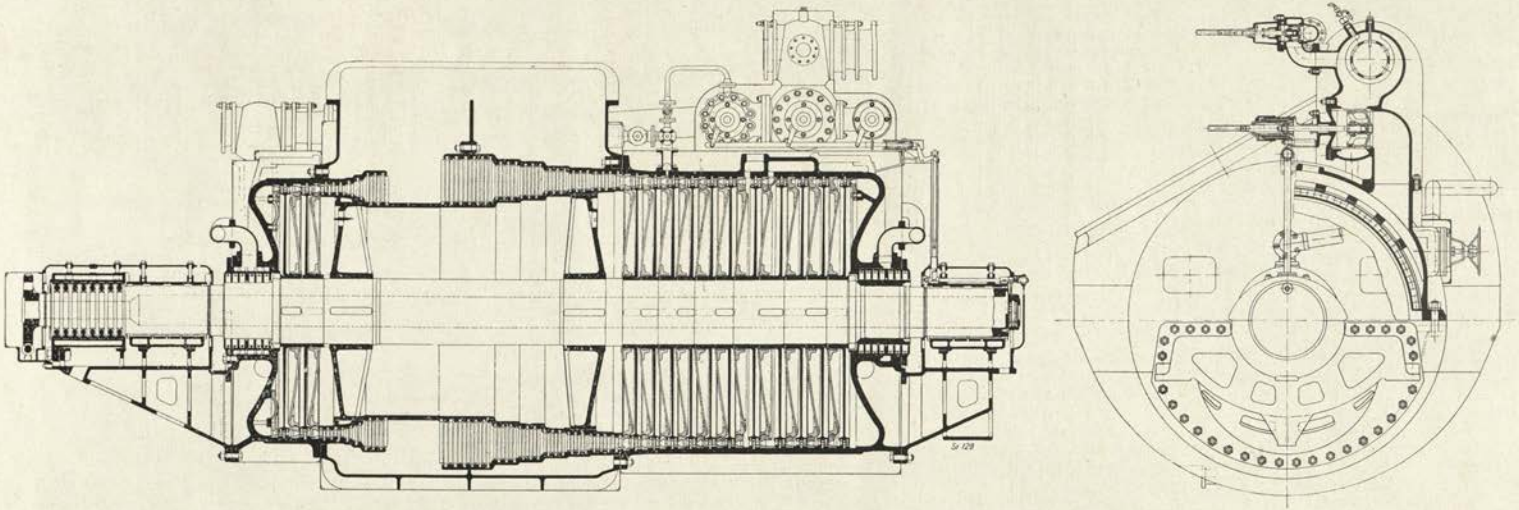


Fig. 5

Turbine of Zoelly Type for Destroyers "Audace" and Animoso."
Messrs. Fratelli Orlando & Co., Leghorn.
Italian Navy.

The method of fixing the blades is shewn in Figs. 6 and 7, both the blades and the intermediate pieces being fitted into T-shaped grooves, and it is worthy of note that this method was used for the first Zoelly turbine and has since always been followed, its extreme simplicity and solidity having given very good results. In the stator as well as in the rotor the same method has been adopted.

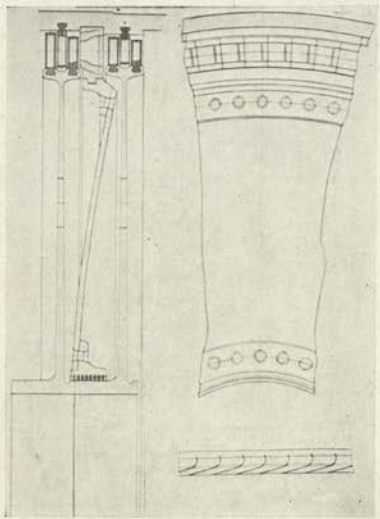


Fig. 6.
Details of High Pressure Blading.
Zoelly Turbine.

Both the blades and the intermediate pieces are made of brass of an especially tough alloy and cut out of drawn bars, the T feet of the blades and distance pieces being machined in the usual way. The outer ends of the blades are riveted to the shrouding strips, which serve both for guiding the steam and for keeping the blades at the right distance from each other. The low pressure drum is also of forged steel carefully annealed and shrunk on to two wheels, one of which has axial clearance on the shaft, so as to allow the drum to expand freely in a longitudinal direction. The high pressure parts of the casing are tested to a pressure of 22 Atms. the mean pressure to 12 Atms. and the low pressure and exhaust parts to 2 Atms.

An interesting feature on these vessels is the thrust bearing used with this turbine. The thrust rings lined with white metal are fitted separately into bronze bearings which are water-cooled. The oil enters the bearing

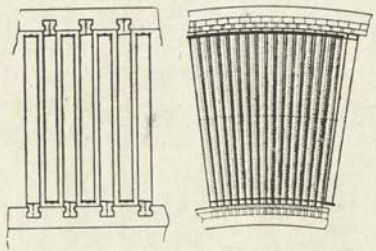


Fig. 7.
Details of Low Pressure Blading.
Zoelly Turbine.

at each second thrust ring and leaves it at each intermediate ring. With this arrangement the oil which enters at a pressure of from one to two atmospheres is forced between the surfaces of a fixed ring and a shaft ring which are pressed against each other whatever may be the direction in which the engines are revolving. The bearing temperatures reached during the trials showed that the lubrication was perfect.

For the lubrication of the turbine bearings as also for the bearings of the propeller shafts an oil pump on the toothed-wheel description* was used, being actuated by the shaft of the circulating pump. This is the first time that such pumps have been used for this purpose on board a warship, and they proved very satisfactory. As no valves are needed in the suction or delivery pipes, there is no possibility of failure and the action of the pump is absolute. The oil is drawn directly from the oil reservoir and delivered through the cooler to the different bearings.

The leading particulars of the vessels are as follows :—

	"Ardito."	"Animoso."
Type of vessel	Thornycroft	Orlando
Type of turbine	Parsons	Zoelly-Orlando
Type of boilers	Thornycroft	White-Forster
Length	238 ft. 0 ins.	245 ft. 4 ins.
Beam	24 ,, 0 ,,	24 ,, 7 ,,
Mean draught	7 ,, 3 ,,	7 ,, 8 ,,
Displacement in tons	598	655

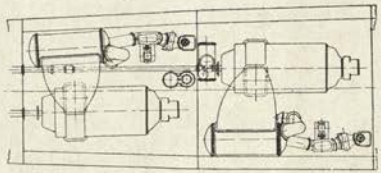


Fig. 8.
Arrangement of Parsons Turbines.
T. B. Destroyer "Ardito."
Fratelli Orlando & Co., Leghorn.
Italian Navy.

Fig. 8 shows the machinery in the destroyer "Ardito," which was built to the Thornycroft designs, while Fig. 9 shows the arrangement in the "Animoso," built to the Orlando design.

All four of the vessels were of course built by Messrs. Orlando, at Leghorn, but the propelling engines of the "Audace," the first vessel of the Orlando type, were constructed at the works of Messrs. Escher Wyss & Co., of Zurich, while those for the sister vessel the "Animoso" were built by Messrs. Orlando themselves. A comparison between the two types of ships is therefore especially interesting, as both vessels and their engines were constructed at the same yard.

The Zoelly turbines were built for a normal power of 14,000 S.H.P. with a maximum output of 16,000 S.H.P. at 650 revs. per minute with dry saturated steam of 230 lbs. per sq. in. and a normal vacuum of 27 ins.

On the three hours' full speed trial of the "Audace" the mean S.H.P. was 19,000 with 664 revs. and a vacuum of 26.2 ins., but as will be seen from the following figures, the Orlando built engine did even better and realized 20,100 S.H.P. with 701 revs. and a vacuum of 27 ins.

The complete figures of the trials are as follows :—

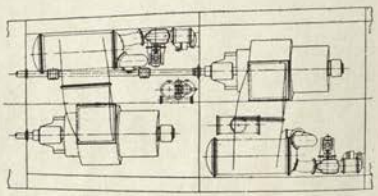


Fig. 9.
Arrangement of Zoelly Turbines.
T. B. Destroyer "Animoso."
Fratelli Orlando & Co., Leghorn.
Italian Navy.

3 hours full power trial.	"Ardito."	"Animoso."
Speed of vessel in knots	33.4	36.12
Steam pressure at boilers, K. per sq. c/m	17.7	18
Revs. per minute	633.6	701.7
Vacuum in c/m	67	67.4
S.H.P.	15150	20100
Cons. of mazout per hour K.	9005	10170
,, ,, per S.H.P. ,,	0.595	0.508
6 hours consumption trial.		
Speed of vessel in knots	13.56	14.2
Steam pres. at boilers, K.	16.7	14.5
Vacuum in c/m	71	73
S.H.P.	750	845
Cons. of mazout per hour K.	938	790
,, ,, per S.H.P. ,,	1.250	0.935
Radius of action at cruising speed with 100 tons of mazout, miles	1444	1797

* See "Fighting Ships," 1907, page 454.

THE BELLUZZO TURBINE.

Another type of turbine has been tried in the Italian navy, designed by Prof. Belluzzo of Milan, which has some special characteristics which distinguish it from other types.

The first marine set was of 1500 H.P. and constructed by the Officine Meccaniche, of Milan and Naples. It has been fitted in a torpedo boat of the Schichau type in place of a reciprocating engine of 1000 H.P., the new engine being arranged as shewn in Fig. 10, the shafting and screw propeller being modified to suit the new engine.

The particulars of the vessel are as follows :

Length – – –	130 ft., 6 ins.
Beam – – –	15 ,, 6 ,,
Mean draft – –	3 ,, 5 ,,
Displacement on trial	80 tons.

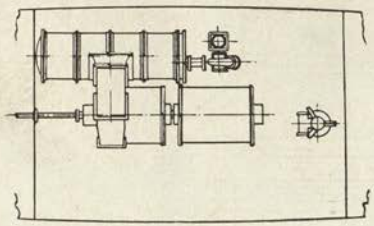


Fig. 10.

Arrangement of Belluzzo Turbine in Torpedo Boat.
Italian Navy.

The new propeller was 3 ft., 9½ ins. in diameter, with a pitch of 3 ft., 6 ins.

The special characteristics claimed for this turbine are that at the cruising speeds special wheels are introduced in the most convenient position as regards the expansion of the steam, which has the effect of reducing the drop in pressure for the different wheels and therefore the velocity of the steam is maintained at such a proportion as to give efficient effects also at low speeds. These special cruising wheels are also so arranged as to serve for astern use, and therefore their provision does not increase either the space occupied or the weight of the turbine.

A second advantage claimed is that the proportions of the wheels and their blades are designed differently from those of other turbines, and based on many experiments carried out by Prof. Belluzzo, and that therefore more efficient results are obtainable at all speeds.

The turbine itself is shewn in Fig. 11, and it will be seen that it consists of two distinct portions, the high pressure and low pressure turbines being quite separate. The high pressure portion contains seven wheels, while the low pressure casing contains two wheels and a drum. At the highest speeds the steam traverses the first four high pressure wheels and then passes to the low pressure turbines, but at cruising speeds the whole of the wheels are utilized. In the last three wheels in the high pressure turbine, the blading is so arranged that they serve for both going ahead at cruising speed and also for going astern,

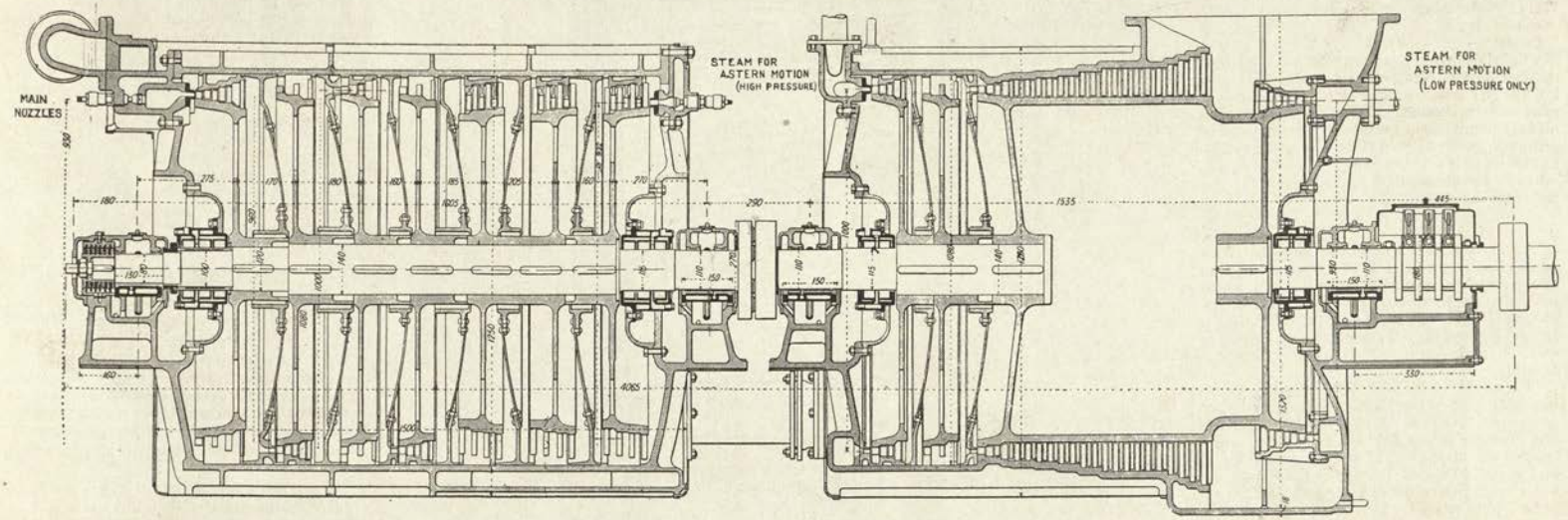


Fig. 11.

Belluzzo Turbine.
Officine Meccaniche, Milan & Naples.
Italian Navy.

and in this latter case the steam passes from them to the astern wheels placed at the far end of the low pressure turbine.

The first high pressure wheel has four sets of buckets, as also the last three, while all the other wheels have three only, whether for ahead or astern.

The whole system is controlled by one hand wheel, by manœuvring which the speed is regulated or the direction of rotation reversed.

The comparative particulars of the two sets of machinery are as follows :—

	Reciprocating Engine.	Belluzzo Turbine.
Power – –	1000 I.H.P.	1600 S.H.P.
Maximum Revolutions – –	350	800
Wt. of engines in tons – –	10.7	8
Wt. of condensing machinery in tons – –	2.25	3

The trials proved very successful, the speed realized being 22 knots against a maximum of 19 knots obtained before, and the engines proved very economical, the consumption of oil fuel at full speed for all purposes being 580 grammes per S.H.P. It is now proposed to fit this class of turbine in a much larger vessel, and the results will be looked for with considerable interest.

GEARED TURBINES.

The practical experience obtained with mechanical gearing for the transmission of the power from the turbine to the screw propeller in merchant steamers and cross-channel vessels has been so favourable that it is now being adopted for nearly all classes of warships, and the result of such applications is being looked for with great interest.

The result of the installation of the Westinghouse gear in the United States navy *has been very satisfactory, and the advantage of the floating frame for automatically maintaining the alignment of the pinions and gear and equalization of the tooth pressures and the compensation of the torsional deflection is becoming so well known that it has resulted in many orders for gears, there now being over 50,000 H.P. under construction and a like power in operation.

*See "Fighting Ships," 1912, page 513.

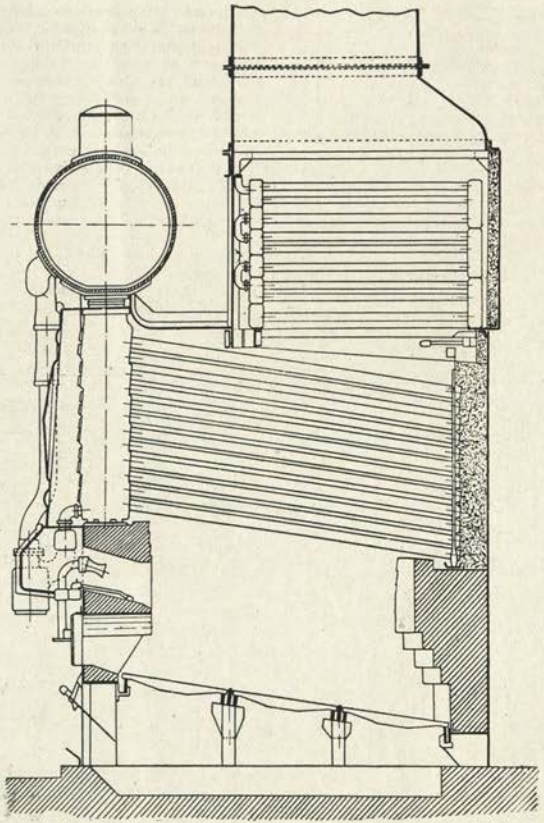


Fig. 12.

NEW TYPE OF NICLAUSSE BOILERS WITH ECONOMISERS.

MESSRS. J. & A. NICLAUSSE, PARIS.

FRENCH NAVY.

The Westinghouse Machine Company at Pittsburg has recently received orders for marine gears for the Destroyer Tender "Melville," and for the cruising gears of the battleships "Pennsylvania" and "No. 39."

The gear for the "Melville" will have two pinions on the horizontal centreline diametrically opposite one another, the pinion speed being 1400 and the propeller revolutions 110. The maximum H.P. to be transmitted is 2000 per pinion.

The battleships "Pennsylvania" and "No. 39" will each have two gears connected to the main turbine shafts by disconnecting clutches, the cruising turbines being out of service at full power, in which case the cruising turbines and gear are not in use. In the case of the "Pennsylvania" each of the gears will nominally transmit 1400 S.H.P. and each has two pinions on the horizontal centreline, the reduction in the number of revolutions being from 1785 to 119. The gears for battleship "No. 39" are also for use at cruising speed only, the revolutions per minute of the cruising turbine being 2500 and those of the propeller 192 at cruising speed. The H.P. of each of the cruising turbines of this vessel will be 2000, and in this case a different arrangement of cruising turbines is used, there being only one cruising turbine on each shaft instead of two as in the "Pennsylvania," and each gear therefore of battleship "No. 39" has only one pinion.

NICLAUSSE BOILERS.

The principal change in boilers is shown in Fig 12, which illustrates the new type of boiler of Messrs. J. & A. Niclausse.

With the adoption of oil fuel, the possibilities of developing a much higher power per boiler have become very evident, and it is to enable such an increase to be readily realized that the modifications have been introduced.

The principal features of the new type are as follows :—

1.—The evaporation tubes have an external diameter of 60 millimetres so that the boilers still belong to the category of "large tube boilers." The lower rows of tubes nearest to the fire have a thickness of 4 m/m, while the others are 2½ m/m thick.

2.—The inclination of tubes from the horizontal is 15 degrees.

3.—The dimensions of the vertical collectors and in particular the section of the upcast passage for the generated steam are considerably increased, the section between the tubes being 4½ times greater than that of the old type.

But the principal change consists in the addition of a "utiliser," really a feed water heater placed over the evaporating nest of tubes, which latter has been slightly reduced in height. The "utiliser" is formed of tubes of 40 m/m diameter, arranged in 15 horizontal elements, each set forming a "U." Each element is composed of a single collector behind and two collectors at the front of the boiler, the one serving for the entrance of the water and the others for the exit.

The feed water enters the utiliser at the part in contact with the exit of the gases of combustion and leaves it by the part corresponding to the entrance of these gases, and the different elements are connected at the front end only by means of connecting pipes, so as to have a definite circulation in the inverse direction to that of the gases of combustion, the idea being in this utiliser to obtain a more methodical circulation by placing the coldest water in contact with the coldest gases.

The boilers with which the official trials were carried out had a ratio of heating surface to grate area as follows :—

Evaporizing tubes – –	24.11
Utiliser tubes – – –	16.56
Giving a total ratio of – –	40.67

The leading particulars were as follows :—

No. of elements – – –	13
No. of ordinary tubes – –	300
No. of thicker tubes – –	156
Total number of tubes – –	456
External diameter of tubes –	60 m/m
Internal diameter of lower rows	52 ,,
,, ,, upper rows	55 ,,
Length of elements – metres	2.300
No. of utiliser tubes – –	780
Length of utiliser tubes ,,	1.216
Grate surface, length – ,,	2.000
,, width – ,,	3.600
,, Total area sq. ,,	7.200
Heating surface of evaporator – sq. metres	173.63
Heating surface of utiliser – – ,, ,,	119.22
Total heating surface ,, ,,	292.85
Water in evaporator cub. metres	2.800
,, utiliser – ,, ,,	1.110
,, total – ,, ,,	3.910
Volume of steam – ,, ,,	1.140

The results of the trial with oil fuel were as follows :—

Rate of combustion per sq. metre of grate – –	K. 135

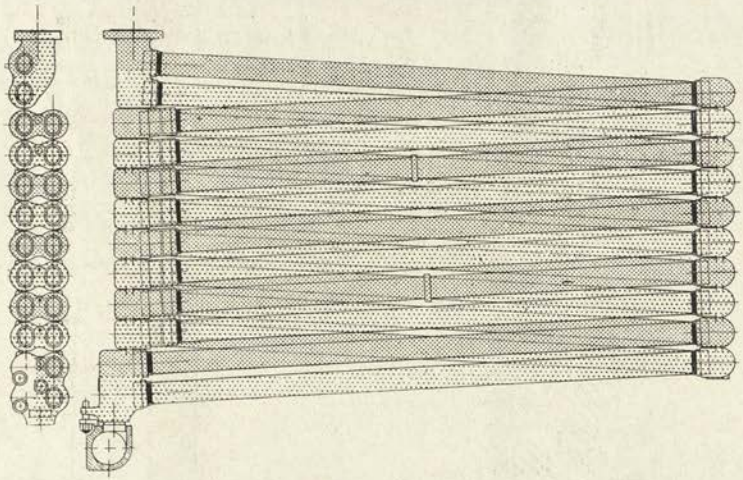


Fig. 13.

NEW TYPE OF ELEMENT FOR BELLEVILLE BOILERS.

MESSRS. DELAUNAY BELLEVILLE & Co., PARIS.

FRENCH NAVY.

Water evaporated per sq. metre H.S. – –	K. 42.77
Temperature of feed water at delivery from utiliser	C. 151°
Temperature of gas at base of funnel – – –	C. 293°
Water evaporated per Kg. of oil fuel – – –	K. 12.958

The smoke was of a pale grey colour, almost colourless, and clearly demonstrated the thoroughness of the combustion.

A trial was also carried out to prove the facility with which the rate of combustion could be changed and the readiness of the boiler to respond to such changes, the time employed at each rate being half an hour. The first period was with burning at the rate of 95 kilos of coal per square metre of grate, this was then nearly doubled to 180 kilos, it was then increased to 225 kilos and finally to the maximum of 240 kilos, which was of the duration of one hour, after which the rate was reduced to 180 kilos again, and after half an hour at this rate, the combustion was suddenly stopped, and a series of changes of rate followed, reproducing somewhat the conditions which would be met with on board when manœuvring.

Amongst other trials carried out was one of 16 hours at a rate of combustion of 225 kilos of coal per square metre of grate and another at a rate of 135 kilos of oil fuel, and the results were altogether satisfactory.

It was accordingly decided to fit the new type of boiler in the battleship "Bearn," which was laid down on the 1st of January, a vessel of 25200 tons displacement with propelling machinery of 36000 S.H.P. and which is to have 21 of these boilers.

BELLEVILLE ELEMENTS.

Another interesting modification is shewn in Fig. 13, which represents the new type of element adopted in the most recent Belleville boilers. It will be seen that instead of consisting of a single spiral each element now consists of two, each formed of half the tubes of the element. These two spirals run parallel with each other between the feed collector and the delivery port to the steam drum, so that although only the same amount of space is occupied, each element now presents a section double the area of the old type of element for the passage of the water being gradually converted into steam. It is also evident that in such case the circulation is much improved, as the distance that is traversed by the mass in movement between the feed collector and the point of delivery is reduced by half its length and has fewer changes of direction, and besides this the angle of inclination of the tubes has been doubled. All this goes to explain why with the new type of element it is possible to obtain a much greater production of steam, and why they can without difficulty stand a much greater rate of forcing.

Eight boilers of the new system will enable the same power to be produced as 11 or 12 boilers of the original type. The rest of the new boiler remains identically the same as before. All the essential parts can be easily dismounted and replaced and the military advantages of this type of boiler have been entirely maintained.

Series of trials have been carried out similar to those described above, the principal one being of 16 hours duration with a rate of combustion of 225 kilos of coal per square

metre of grate, this being followed by another of the duration of one hour at 240 kilos. The trial at different rates of combustion was of the duration of four hours, and these were varied at the will of the commission; they included instant changes from natural to forced draught, and *vice versa*, as also changes from coal fuel to oil fuel, and the boiler was found to respond perfectly. Particular attention was given to the amount of smoke produced, and at all rates of combustion the conditions were found to be satisfactory.

YARROW BOILERS.

Some additions have also been made to these boilers which still further increase their efficiency, and in Fig. 14 is shewn the latest method of fitting Messrs. Yarrow's patent angle baffles between certain of the boiler tubes which are in the rows furthest from the furnace.

It has been found in practice that the addition of angle baffles suitably placed at A increases the evaporation efficiency of the boiler about 3 to 4 per cent. This is due to the fact that the gases flow more evenly over all the water tubes. It has also been found that when burning coal the angle baffles greatly reduce the amount of secondary combustion which has been found to take place in the uptakes and funnels of large battleships and cruisers owing to inferior stoking. The baffles appear to have the effect of causing all the gases to burn below the water tubes, even though the stoking may not be what it should be.

As the angle baffles are easily portable they do not interfere with the cleaning or examination of the external surfaces of the tubes.

The illustration also shows the latest method of introducing the feed water into the boiler, and it will be observed that longitudinal division plates in the steam drum as at B are now fitted in conjunction with the feed partition plates in the water pockets, thus causing the feed water to ascend the tubes in the rows most remote from the furnace. The efficiency of the boiler is thereby augmented through the relatively cold feed water abstracting a further amount of heat from the furnace gases.

The effect of the longitudinal division plates in the steam drum is to prevent the feed water which ascends the tubes in the outer rows to short circuit into the tubes in the rows which are nearest the feed heating tubes. This not only reduces the differences of temperature which would otherwise exist in the boiler, but also causes the circulation of the water inside the boiler to be improved, in so far that the saturated steam given off from the boiler is perfectly dry and does not contain any moisture. The effect of these longitudinal division plates has been found to be most marked in the case of boilers fitted with superheaters, thus permitting a higher degree of superheat to be obtained through the saturated steam leaving the boiler being perfectly dry. The steam consumption of both turbines and reciprocating engines is also reduced through using initially dry steam.

It has been found that longitudinal division plates do not interfere in any way with the cleaning or the examination of the inside of either the boiler or the water tubes.

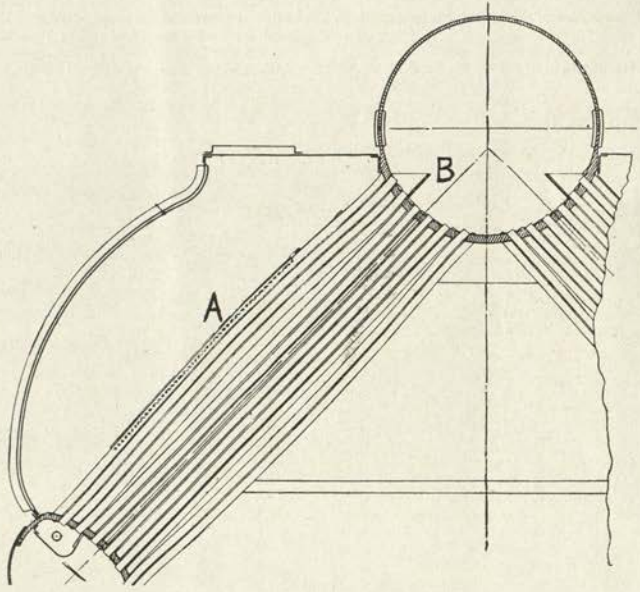


Fig. 14.
ADDITIONS TO YARROW BOILERS.
MESSRS. A. F. YARROW, GLASGOW.
JAPANESE NAVY.

BOILER ECONOMY.

With a view to increased economy and better working of boilers, special attention is being given to efficiency of combustion both as regards oil fuel and coal, and increased use is being made of apparatus which assists in such a direction. Apparatus for recording the amount of CO_2 had been tried on board war vessels having a large number of boilers as far back as 1896 when it was adopted on the trials of the Italian battleship "Sicilia," with good results*, but in its then form it was not considered sufficiently practical and no further use was made of it. However, undoubted advantages have been found in cases where such apparatus has been installed and efficiently handled on merchant vessels, and in the United States navy considerable use is now being made of it.

When the famous cruise of the U. S. battleships round the world took place, it was found that certain of the vessels were more wasteful of fuel than others, and there was nothing like uniformity in the coal consumed per knot steamed; indeed, in some sister ships there was a considerable difference in the amount consumed which in some cases amounted to as much as 20 per cent.

The Bureau of Steam Engineering took up the matter in earnest, and the study of the causes and the combustion and firing problems involved, led to a considerable diminution in the amount of fuel wasted, with the astonishing result that the battleships of the United States navy now steam 31 per cent. greater distance on a ton of coal than was the case in 1908.

Although a certain amount of this gain is due to the greater attention being given to the subject of stopping all possible air leaks, firing at correct and regular intervals, keeping furnace doors open no longer than is absolutely required and such like improvements, which have to do principally with the management of the boiler, and proper education of the human element, still no inconsiderable amount of the improvement is due to the adoption of scientific apparatus on board the ships.

One of the principal of these is an apparatus known as the Hays Automatic CO_2 and draft

* See "Engineering," 3rd April, 1896, page 452.

recorder constructed by the Combustion Appliances Co., of Chicago, shewn in Fig. 15.

This apparatus has been fitted to sixteen battleships in the United States navy, each ship having two hand gas analyzers and the necessary number of gas collectors. In some cases one collector is used for two boilers and in others a collector is fitted for each boiler. In the case of the battleship "New York," two gas analyzers and four collectors are provided, one collector serving three boilers. On this vessel a recording CO_2 instrument is also fitted, and is giving good results.

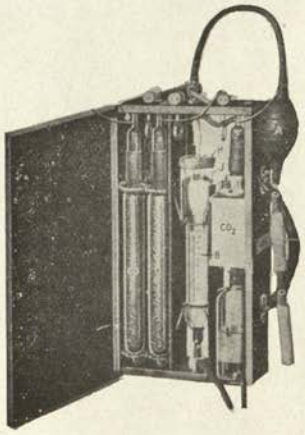


Fig. 15.

Hay's Gas Analyser.

Combustion Appliances Co., Chicago.

United States Navy.

BOILER EFFICIENCY METER.

Another useful appliance in the direction of economical working is shewn in Fig. 16. It is known as the Blonk boiler efficiency meter, and is manufactured by Messrs. A. W. Blonk & Co., Chicago.

The idea of this apparatus is that if the inefficiency of the boiler can be pointed out, and an indication be given of the reason of it, a great step in advance has been taken towards bringing about a more perfect efficiency. The two principal reasons for inefficiency are, of course :—

(*a*) The admission of too little air to the furnace ;

(*b*) The admission of too much air.

In the first case it is not possible to get all the heat units out of the fuel, as there will not be a sufficient supply of oxygen to obtain a perfect combustion, and a considerable portion of the potential heat value of the coal will pass up the funnel without being converted into heat, and be absolutely wasted.

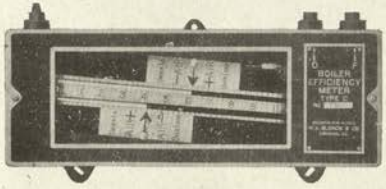


Fig. 16.

Boiler Efficiency Meter.

Messrs. W. B. Blonck & Co., Chicago.

United States Navy.

On the other hand if too much air is supplied the result is equally wasteful, as too much oxygen is being supplied for the amount of combustion that the coal contains, and in consequence, the excess of air passing through the furnace and boiler is heated and passes away, carrying with it just so much heat which ought to have been devoted to making steam.

The point of true efficiency is intermediate between these two limits, and in order to arrive at it perfect firing must be realized, but the difficulty is that this point varies with different conditions of load, with different qualities of fuel, and with different thicknesses of fuel in the furnace.

The efficiency meter assists in arriving at the point of perfect firing and the method of maintaining it constantly and exactly, and this is done by a simple arrangement of two U tubes which register both the resistance of the bed of incandescent fuel to the air traversing it, and also the resistance of the boiler to the hot air passing through it, the measure of these resistances being an unfailing measure of the volume of air passing through the furnace of the boiler, as the more air you pass through a given area the greater the resistance. With a number of boilers it is found of great service, for if a boiler is being overworked it is at once evidenced, or if another is not doing its full task it is quickly made manifest.

The apparatus consists of two sensitive draught gauges arranged in combination one above the other, the lower one is filled with red oil and shows the drop in draught through the fire, while the upper gauge filled with blue oil registers the drop in draught between the furnace and the funnel. Two sliding indicators with an arrow head in the centre are arranged so that they can be readily set at the point of best efficiency, and these are plainly marked with legends showing underload and air plus at one side of the arrow head and overload and air minus at the other side. These gauges operating together show exactly what conditions prevail when the indications are shewn on either side of the arrow head., etc. Reference to the chart furnished with every installation shows where the defect is, so that it can be promptly remedied, and the boiler efficiency maintained at its highest point.

The apparatus is set for the normal working conditions of the plant, but should these be varied, a little observation soon shows what is the normal position of the gauges under the new conditions of operation.

It is found that an intelligent stoker quickly realizes the value of the apparatus, and can be easily trained to observe its indications.

CALORIMETER.

It is very evident that the results obtained from the conversion of fuel into work should be referred to the calorific value of the fuel itself to obtain a standard basis of comparison, and this point is now so universally recognized that tests are now generally made giving the value of the fuel under its worst and best conditions, that is, with the coal with its whole moisture intact, as used by the stoker, and also on a fully dried sample.

For obtaining the true evaporative value by far the handiest and most effective calorimeter is that known as the "Roland Wild"

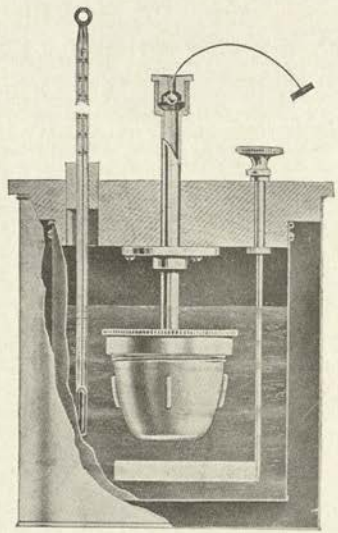


Fig. 17.

"Roland Wild" Calorimeter.

Messrs. Alex. Wright & Co., Westminster.

British Navy.

type, shewn in Fig. 17, and made by Messrs. Alex. Wright & Co., Westminster.

This apparatus consists of a combustion chamber with screwed cap suspended from the cover by a stout tube furnished with a valve. The water vessel is of copper and is surrounded by an outer casing heavily

nickeled, the annular space between the two vessels forming an air jacket which effectually prevents radiation and absorption, thus rendering the rise in temperature of the water an absolutely true guide to the heat given off by the fuel. An agitating paddle or stirrer is provided, working in the water vessel and manipulated from the outside of cover. A sensitive thermometer, 40° to 100° Fahr. is provided, the scale being divided into tenths of a degree and easily reading to $\frac{1}{20}$°. The calorimeter as described is also provided in two other forms, in one of which the firing of the fuel mixture is effected electrically and in the other the stirring is also so effected. The operation of ascertaining the calorific value is very simple, the great point to be observed is that the sample itself should really represent the bulk of the coal from which the sample is taken. If it is delivered in trunks or wagons, the best way is to take a certain amount from one in each ten; if, however, the coal is already in the bunkers, or heaped, care must be taken to procure portions from the top and the bottom, and from the under part as well as the outside, and as far as possible from different parts of the mass or heap.

The test is made by placing a definite amount of the powdered fuel and sodium peroxide intimately mixed into the crucible, and the exact amount of water specified in the water vessel. This is stirred until the temperature is constant, and the degrees are then noted.

The charge is fired either by dropping a piece of hot nickel wire through the valve opening, or by passing a current from a small accumulator or a lighting circuit. The water is then agitated by means of the stirrer, and the highest temperature is noted; then the rise in temperature multiplied by 1000 gives the gross calorific value in the B.T.U.'s of the coal tested and this divided by 967 gives the gross evaporative power per lb. of coal.

For example, if the rise in temperature is 13.15° the coal value is 13150 B.T.U., and the evaporative power is

$$\frac{13150}{967} = 13.6.$$

The simplicity of the manipulation and the accuracy of the results obtained with these instruments have led to their general adoption wherever it has been desired to work steam generators on more scientific lines.

RECORDING INSTRUMENTS.

The demand for a continuous record of the readings during a trial or voyage has led to further developments in the instruments designed for such purposes.

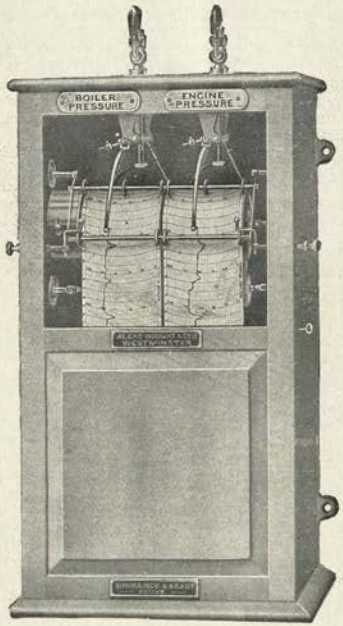


Fig. 18.

STEAM PRESSURE RECORDER.

MESSRS. FERGUSON & TIMPSON, LTD., GLASGOW.

Fig. 18 shows the Simmance and Abady patent steam pressure recorder constructed by Messrs. Ferguson & Timpson, Ltd., Glasgow, an apparatus which is designed to give an accurate record of the steam pressure maintained during a voyage of any duration.

In the duplex type shown two recorders are mounted in one case side by side and indicate the pressure on separate charts rotated on the same drum by one clock. They are arranged, one to record from the boiler or main steam pipe, and the other from the casing of the high pressure valve or of the turbine. The records thus show how the steam pressure has been maintained, whether there has been a drop in pressure and what has been the effective steam pressure at the engines.

The records are made on charts which last for 60 days and feed down into the case which is of sufficient capacity to hold the total amount, or the portion on which the record is made can be removed on completion of the day's run.

The clock requires winding every eight days and is wound from the outside of the case although mounted inside the case within a metal cylinder. It can be stopped or started at will by a special contrivance so that the recorder can be put out of action when the vessel is in port or at other periods when desired. An operating push outside the case is so arranged that the officer going on watch can mark on the chart the moment of his taking charge.

The pen mechanism is so balanced as to be unaffected by movements of the vessel.

As the recorders are generally placed in a cabin above the engine room, it is necessary upon installation to adjust for the opposing head due to difference in level between the position of the recorder and its connection points. A simple zero device enables this adjustment to be made once and for all when the apparatus is installed.

POWER RECORDER.

A still further advance has been made in instruments for recording the power developed in the cylinders of an engine, and the latest one renders it possible to ascertain instantaneously the mean indicated horse power of any reciprocating power unit, by merely reading off the cyphers of a recording apparatus and multiplying this amount by the constant corresponding to the cylinder whose power is required.

When the ordinary type of indicator is used to determine the mean I.H.P. of reciprocating engines it has hitherto been the practice to take diagrams at regular intervals and these diagrams serve as a basis from which the mean power is calculated. Such a method however by no means gives that degree of accuracy which is aimed at in modern technical practice, since only every 1000th to 4000th working cycle of the engine is really taken into account in arriving at the result.

The unreliability of such a system for a really satisfactory recording of the power on the long trials which are now the rule has for some time been recognized, and endeavours have been made to remedy this by producing indicators which would give continuous indications over a considerable period of time, but although these have been found to give sufficiently satisfactory results they have not come into general use. The reason is not far to seek, for the calculating of a series of indicator cards taken at comparatively short intervals during a trial of six or twelve hours is no easy matter, but when these diagrams are multiplied indefinitely the work involved is endless and certainly not compensated for by the results obtained.

But the whole of the calculations are now carried out by the instrument itself, which determines the mean horse power of the cylinder over any desired period of time and takes into account every diagram developed.

This apparatus is shewn in Fig. 19 and is known as the "Bottcher" power recorder. It is constructed by Messrs. H. Maihak, of Hamburg.

The instrument is made in two types. In one it is possible to take one or more check-diagrams on a single diagram sheet during the period of counting, while in the other the diagram sheets can be changed whilst the counter is in motion and hence an unlimited number of check diagrams may be obtained.

It will be seen that the main part of the instrument corresponds to the usual type of indicator with an external spring which is fixed to the holder A in the usual manner. Projecting from this is a standard B which carries the bracket C and this is firmly held to the standard by the keep screw D with milled

head. The bracket C carries the bell crank levers which are connected to the crosshead at the top of the piston rod by the connecting rods E. The recording apparatus is shewn at F underneath which will be seen the planimeter wheel G which works on the top of the drum H and to which the vertical motion of the piston rod is communicated in the form of horizontal movement through the bell crank levers and connecting rods. The movement of the wheel is transmitted by gearing to a

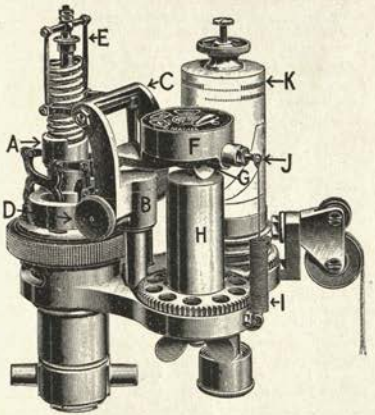


Fig. 19.
BÖTTCHER POWER RECORDER.
MESSRS. H. MAIHAK, HAMBURG.
GERMAN NAVY.

pointer in the centre of the recording apparatus F and to the three other reading discs shewn around the circumference and which show units, tens, and hundreds.

The wheel G is arranged as to always bear with a certain given pressure against the working surface of the drum H by means of the tension spring I attached to the outrigger J. The wheel and the periphery of the drum are directly proportional to the mean indicated pressure and thus also to the mean indicated horse power.

The paper drum K is arranged with a disconnecting stop which permits the diagram sheets to be inserted and removed during the course of the work without in any way interfering with the continuous recording apparatus, so that check-diagrams can be taken at any moment and at any intervals desired.

The total rotation of the planimeter wheel is proportioned to the area of the ordinary diagrams and with each stroke of the piston the area of the successive diagrams is added by the recording gear. Considerable accuracy is obtained by this instrument and two instances of its ordinary work may be given to illustrate this.

In the first case the recorder was in use for ten minutes during which 2084 diagrams were taken. These when calculated by the ordinary method with a planimeter gave a maximum area of 325 and a minimum area of 280 square millimetres, the mean of these being 302.5 while the reading of the recorder gave 300.5.

In the second case the apparatus was at work for five minutes, during which period 1318 diagrams were taken. The maximum area as worked out with the planimeter was 555 and the minimum area 490 square millimetres, the mean being 522.5 while the recorder gave 523 square millimetres as the actual figure.

The high economic value of the apparatus above described will only be fully realized when it is taken into consideration that differences between the different sets of diagrams do not in any way influence the correctness of the final result, for account is taken of the actual results of every stroke made by the engine. It also facilitates the whole process of determination of the indicated power in a manner previously undreamt of, and the work is now confined to the taking of two readings which entirely replace the whole planimeter method formerly employed. Operations which used to take days are now replaced by work occupying only a few minutes and since the recorder is combined with an indicator which can be used at any moment, it is possible to take diagrams from the cylinders as usual during the trial period so as to know approximately what the engines are doing at any given moment, while the recorder gives exactly the mean results since the trial began.

OIL FUEL.

The number of warships being fitted for burning oil-fuel only is considerably on the increase. In the British Navy the total number of war vessels fitted or to be fitted is 166. Of these 5 are battleships, 16 cruisers, 109 destroyers and 36 torpedo boats, and this number is shortly to be further added to.

The Commission on oil-fuel has recently issued a statement to the effect that the advantages to be derived from the use of oil-fuel and the imperative necessity of such use, if the fleet is to be maintained in a condition of the highest attainable efficiency have been most conclusively established, and in accordance with their recommendations large reserves are being accumulated both in the United Kingdom and in other centres on British Territory, the extent of these reserves bearing a prescribed relation to be actual consumption under peace requirements which is taken as the definite basis of the required supplies.

At present the amount stored is stated by the Government to be more than sufficient for three years' consumption on a peace basis, and it is further stated that they propose to keep stored in the country itself sufficient oil-fuel to enable them to conduct a whole year of war, the supply being increased as oil burning vessels are added to the fleet.

The total consumption of oil-fuel in the British navy is at present about 200,000 tons per annum, and it is proposed to draw supplies from Burma, California, Persia, Texas, Roumania, Borneo, Egypt, Mexico and Trinidad, all of which countries are stated to be able to supply oil-fuel of satisfactory quality for naval purposes.

The only other navy that is adopting oil-fuel to any great extent is that of the United States, and the advantages of oil-burning exclusively have been found from experience to be so very considerable that it is very probable that most of the new fighting ships, whether large or small, will be fitted for burning oil-fuel only. There are now built or building 4 battleships and 41 destroyers besides several auxiliary craft which are to use oil-fuel exclusively.

At present the consumption of fuel-oil in the United States navy is 30 million gallons per annum, and according to present arrangements it is expected that this amount will be eventually increased to 125 million gallons and provision is being made for the needs of the navy on this basis.

In view of the great increase in price and the difficulty that may arise later in obtaining sufficient supplies, the U. S. Naval Authorities have been wise enough to secure the control over a large area of the California oil fields which is estimated to be sufficient for 25 years' supply.

FUEL OIL SPECIFICATIONS.

Considerable interest was aroused by the revision of the specification for fuel-oil by the British Admiralty. A former revision had been made in 1910 and dealt with the requirements as regards flash-point, fluidity at low temperatures, percentage of sulphur, presence of water, acidity and freedom from impurities. It was prescribed that :—

(*a*) The flash-point should not be lower than 200°F., close test.

(*b*) The proportion of sulphur contained in the oil should not exceed 0.75 per cent.

(*c*) The oil supplied should be free from acidity.

(*d*) The quantity of water delivered with the oil should not exceed 0.5 per cent., and

(*e*) The oil supplied should be sufficiently free from paraffin or bitumen to flow freely by gravitation with a head of 2 ft. at a temperature of 32°F. through a horizontal length of three feet of copper pipe of half an inch bore.

The modifications deal with the flash-point, sulphur, acidity, and viscosity, having been made as the result of expert advice and experiment, and further experiments are still proceeding.

The new specification requires that :—

(*a*) The flash-point shall not be lower than 175°F. close test, except in the case of oils of exceptionally low viscosity such as distillates from shale when the flash-point must be not less than 200°F.

(*b*) The proportion of sulphur contained in the oil shall not exceed 3 per cent.

(*c*) The oil-fuel supplied shall be as free as possible from acid, and in any case the quantity of acid must not exceed 0.05 per cent. The prescription as to the quantity of water delivered with the oil remains as before.

(*d*) The viscosity of the oil supplied shall not exceed 2000 seconds for an outflow of 50 cubic centimetres at a temperature of 32°F.

It is also stated that some further modifications in respect of the percentages of sulphur and water, and of the standard of viscosity have been and will be admitted within certain necessary limits, on account of natural variations of oils from different sources of supply.

The modifications made have the effect of largely increasing the amount of oil available for the use of the British navy and admit a large quantity of oil from the deposits in Mexico, which were formerly outside the specification on account of the percentage of sulphur it contained. Much research has been carried on in this direction and it is found that it is quite permissable to raise the proportion to the amount given as being quite innocuous.

VISCOMETER.

The viscosity is to be determined by the Admiralty type of Viscometer which was designed by Sir Boverton Redwood, and is constructed by Messrs. Baird & Tatlock, (London) Ltd.

This apparatus is shewn in Fig. 20 and consists of a silvered brass oil-cylinder, furnished with an agate jet, and surrounded by a copper bath. A copper tube, closed at the lower end, projecting at an angle of 45° from the side of the bath near the bottom, provides a means of heating the bath liquid, and by the use of a revolving agitator, which forms part of the apparatus, the heated liquid rising from the copper tube can be uniformly distributed through the bath. The agitator carries a thermometer to indicate the temperature of the bath. The oil cylinder is furnished with a stopper, consisting of a small brass sphere attached to a wire, the sphere resting in a hemispherical cavity in the agate jet. A short standard attached to the oil-cylinder, carries a clip to support a thermometer in the oil. Inside the oil cylinder, and

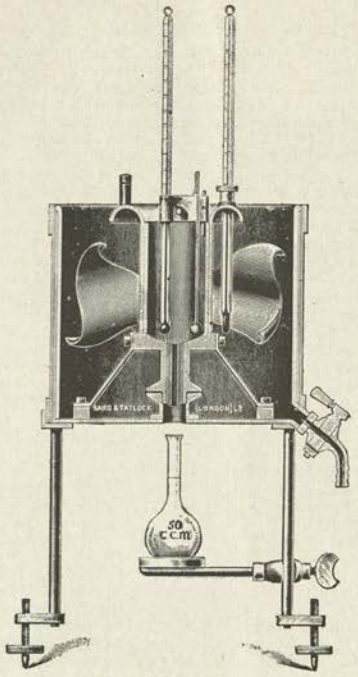


Fig. 20.

Sir Boverton Redwood's Viscometer.
Messrs. Baird & Tatlock, Ltd., London.
British Navy.

at a short distance from the top, is fixed a small bracket, terminating in an upturned point, which forms a gauge of the height of the oil level. The instrument is supported on a tripod stand provided with levelling screws.

The bath is first filled with a suitable liquid to a height roughly corresponding with the point of the gauge in the oil-cylinder. Water answers well for the temperature up to 200°F. but for higher temperatures a heavy mineral oil is generally used. The liquid having been brought to the required temperature, the oil to be tested, previously brought to the same temperature, is poured into the oil-cylinder, until the level of the liquid just reaches the point of the gauge. A narrow-necked flask, holding 50 cubic centimetres to a point marked on the neck, is placed beneath the jet in a vessel containing a liquid of the same temperature as the oil. The ball valve is then raised, a stop watch at the same time started, and the number of seconds occupied in the outflow of 50 cubic centimetres noted. It is of the greatest importance that the oil-cylinder should be filled exactly to the point of the gauge, after inserting the thermometer, and that the given temperature should be precisely maintained during the experiment, a difference of $\frac{1}{2}$°F. making an appreciable alteration in the viscosity of some oils.

In order to express the results the number of seconds occupied in the outflow of 50 cubic centimetres of the oil under examination is multiplied by 100 and divided by 535 (the number of seconds occupied in the outflow of 50 cubic centimetres of average refined rape oil at 60°F.) The resulting figures are then multiplied by the specific gravity of the oil under examination at the temperature of the experiment, and divided by 915 (the specific gravity of refined rape oil at 60°F.) the necessary correction for specific gravity being thus made, the final figures express the viscosity of the oil, at the temperature of the test, in terms of viscosity of refined rape oil at 60°F.

The regulations for the acceptance of oil fuel for the United States navy are somewhat different to those given above and prescribe that :—

(*a*) The flash point should not be lower than 150°F. (60°C.) close test, nor more than 250°F.

(*b*) It should be rejected if it contains more than 1 per cent. sulphur.

(*c*) It should not contain more than a trace of sand, clay or dirt.

(*d*) The quantity of water delivered with the oil is not to exceed 2 per cent.

(*e*) It should flow readily at ordinary atmospheric pressure temperatures and under a head of 1 foot of oil through a 4 inch pipe 10 feet in length, and should not congeal nor become too sluggish to flow at 32°F. (0°C.)

There is a further regulation that it should have a calorific value of not less than 10,000 calories per gram (18,000 British thermal units per pound) 10,250 calories to be the standard. A bonus is to be paid or a penalty deducted accordingly, as the fuel oil delivered is above or below this standard.

For the Italian navy fuel oil is taken both from Roumania and from Texas, and the conditions are somewhat varied for the two qualities. For the oil from Roumania it is prescribed that :—

(*a*) The specific weight should be between 0.925 and 0.960 at the temperature of 15° Cent.

(*b*) The flash point should not be lower than 100° Cent. nor more than 150° Cent.

(*c*) The calorific value should be not less than 10250 calories.

(*d*) It should not contain more than 0.5 per cent. of sulphur.

(*e*) The oil fuel must be free from acid and ash.

The conditions for the oil from Texas prescribe that :—

(*a*) The specific weight should not be less than 0.892 at 20° Cent.

(*b*) The flash point should not be lower than 100° Cent.

(*c*) The calorific value should be not less than 10,500 calories.

(*d*) It should not contain more than 0.6 per cent. of sulphur.

(*e*) The viscosity, as determined by the Engler type of apparatus and based on that of water at 20° Cent. is to correspond to the following :—

From 9 to 10 at 20° Cent
From 2.5 to 3 at 50° Cent
From 1 to 2 at 70° Cent.

* * *

Motor ships are giving a good account of themselves in the merchant service and are proving themselves economical where their run takes them to a place where fuel-oil can be had at a reasonable price, but the great

increase in the cost of fuel-oil and the difficulty of obtaining it renders the more general adoption of the internal combustion engine quite out of the question at present for the majority of vessels. Engine troubles are being steadily overcome and many of those which have been met with have been largely due to the construction of such machinery being undertaken by those who had no experience and little knowledge of the special requirements.

But as regards size of cylinders and amount of power developed, there has been little or no progress.

So far, the most powerful engines in service are the six-cylinder four-cycle engines constructed by Messrs. Burmeister & Wain, at Copenhagen, and installed in the motor ship "Fionia." The cylinders are 29 ins. diameter with a stroke of 43½ ins., and the engines develop each about 2050 H.P. at 105 revolutions per minute, which give the vessel a speed of about 14 knots.

The design of the machinery is very similar to that of the "Selandia,"* but the main framing of the engines approximates more closely to the usual marine type for steam engines, the cylinder being carried on very solid A frames. Between these are doors of light plating which close in the whole of the working parts both at the back and front so that the whole engine is enclosed, but the doors can readily be removed when required.

Another difference is the substitution of water for oil in cooling the pistons, the communication to the interior of the pistons being made by means of telescopic pipes.

Another change was in the air compressor for the injection air which in the former ships had the high pressure stage driven directly from the main engine, the others stage of compression being effected by a compressor driven by a separate Diesel engine. This arrangement was substituted in the "Fionia" by driving a complete quadruplex compressor off the end of the main engines. It was found however that the change was not productive of good results, and the system was replaced by a new vertical type, which so far has given good results. The capacity of the compressors is about 13 cubic metres of air per minute, while the consumption of the engine is somewhat under 12 cubic metres per minute.

Electricity is used to a very large extent for driving the auxiliary machinery, the steering engine, capstan engine and 12 winches being so driven, besides sundry pumps for various purposes.

*See "Fighting Ships," 1912, page 534.

DIESEL ENGINES AND LUBRICATING OIL.

Amongst the mishaps which have occurred with Diesel engines was an explosion which occurred at the Electricity Generating Station at Bray in Ireland. The results of the official enquiry into the cause have now been published* and have excited general interest as several accidents had occurred with this type of engine, the cause of which had been more or less unexplained until this report appeared. The mishap referred to unfortunately resulted in the death of one man and serious injuries to two others. The engine in question had a single cylinder 12 inches diameter, and worked on a four-stroke cycle developing about 50 H.P. Compressed air for fuel ignition and starting purposes was obtained from a two-stage air compressor driven directly from the main engine shaft. An inter-cooler was provided for cooling the air between the two stages of compression and the air passed through another cooler after the final compression. From this after-cooler the compressed air at a pressure approaching 900 lbs. per square inch passed into the blast air vessel. This air vessel consisted of a lap welded mild steel cylinder 3 feet in length 8 inches external diameter, and $\frac{13}{32}$ inch in thickness. A ¾ inch copper pipe with an open end extended almost to the bottom of the vessel; this pipe acted as a drain for any condensed water, and also conveyed the compressed air to the two starting air vessels. The three air vessels were rigidly tied together by means of wrought iron straps and bolts, they were placed in a vertical position with their tops in the same plane and the lower ends of the vessels below the floor level.

The explosion occurred just as the engine was being started up. The engine began to move and the starting lever was put over from the "starting" to the "running" position and the instant after an explosion occurred at the fuel valve on the cylinder, a blue flame was seen to travel along the blast pipe to the blast vessel, and this latter exploded with great violence. It was found blown into eight pieces and the interior surfaces of the fragments forming the centre of the vessel were blued showing subjection to a very high temperature, and on examination of the vessel and its material it was estimated that a pressure of at least 5320 lbs. per square inch was necessary to rupture the vessel, and that the explosion was due to rise of temperature and increase in the gaseous contents due to ignition of some combustible material within.

* Cd. 6964, 1913.

The report states that when a Diesel engine is running on normal load, the ignition of the fuel-oil does not take place so rapidly as to cause an explosion, but the finely sprayed oil burns more or less quietly in the compressed and heated air. It is however well known that on starting these engines the initial strokes are often accompanied by explosions of considerable violence, which are usually attributed to an excess of fuel-oil in the engine cylinder.

The fragments of the blast vessel were not much reduced near the edges of the fractures, though there were indications that the material was sufficiently ductile to have shown under a steadily increasing pressure, considerable thinning before fracture. It was therefore concluded that an explosion occurred within the vessel and developed with such rapidity that an instantaneous pressure was produced causing a stress in the walls beyond the ultimate strength of the material. The explosion appeared to have been localised near the central portion of the vessel, which showed signs of exposure to a higher temperature than the ends, and there was absence of any stretching or damage to the four bolts securing the steel head of the blast vessel.

The report goes on to state that, "under ordinary conditions of working, the blast vessel contains an oily emulsion in addition to compressed air. This emulsion is a mixture of water from the moisture in atmospheric air and traces of lubricating oil from the air compressor cylinder. Though much of the water and oil is removed by drains on the air coolers of the compressing plant, appreciable quantities of these pass over as vapours into the blast vessel and are there condensed. In the case of this engine the oily emulsion was blown periodically from the blast vessel into the starting vessel from which it was drained at intervals. In course of time the interior of the vessels becomes coated with oily matter. There is definite proofs of oily deposits within blast vessels and similar compressed air cylinders. Since the explosion at Bray, an explosion of a blast vessel occurred on the "Vulcanus," a ship fitted with Diesel engines, whilst lying in port, and two engineering experts who examined this exploded vessel stated that the interior had an appreciable coating of oily matter. The blast vessel of the "Vulcanus" had been in use about a year, whilst the blast vessel at Bray had been in use over two years and the interior had never been scraped or otherwise cleaned. Many explosions and failures of air receivers used in connection with compressed air plants for mines, factories and other works, have been traced to ignition of lubricating oil or vapour carried over into the receivers.

Some of the oily deposit probably was vapourised and ignited by injection of heated air or vapour into the blast vessel, and it seems clear that the explosion of the blast vessel would not have occurred if the walls of the vessel had been free from oily deposit."

This conclusion is supported by the results of exhaustive enquiries which had been made as to other mishaps which had occurred with similar plants, and the report goes on to say, "Many explosions and failures of air receivers connected with air compressing plants, have been recorded in the past, which have been traced to the presence of lubricating oil in these receivers.

As the result of enquiry, it has also been found that similar explosions have occurred in the pipes and air vessels of Diesel engines. At Barrow in 1911, an engineer was killed by the explosion of a compressed air receiver pipe of an experimental oil engine on the Diesel principle. The pipe was cooled by a water-jacket, but at the inquest, the works' chemist attributed the explosion to ignition of lubricating oil vapour which had been carried over from the compressor and formed an explosive mixture with the compressed air. In several cases explosions have occurred in the high pressure air delivery pipe near the

compressor. Generally the pipe had been subjected to a high temperature, and contained carbonaceous deposits, showing that carbonisation and ignition of the oil vapour had occurred. In some instances these deposits appeared to have choked the pipe sufficiently to cause an explosion by rise of pressure and in one case an explosion which occurred in the blast vessel blew the safety valve across the engine room and fractured the blast pipe near its connection with the steel head on the blast vessel."

The report calls attention to the fact that owing to presence of oil in the blast vessels of Diesel engines there is the same possibility of ignition and explosion in these vessels as in the air receivers of ordinary air compressing plants. Moreover, the ignition temperature of the oil vapour is lowered at the high pressures employed with the Diesel engines. Mineral lubricating oils with high flash-points should always be used in the cylinders of air compressors. Since any defects in the cooling arrangements or in the discharge valve of a compressor may result in a considerable rise in temperature of the compressed air, the amount of lubricating oil vapourised may be increased and the ignition temperature easily reached if the defect is not discovered. Temperatures above 130°F. have been taken on the outside of a blast vessel, with an engine running under normal conditions. There is also the possibility of ignition of the oily deposit in the blast vessel of a Diesel engine, by a "back fire" from the engine cylinder into the fuel valve casing and blast pipe. Such a case is known to have occurred in connection with a marine Diesel engine when the blast pipe was burst for a length of 20 feet.

It is recommended that in order to reduce the risk of explosions and accidents in connection with the running of Diesel engines that traces of oil or oil vapours should be removed as far as practicable from the compressed air before it passes into the blast vessel, and that air vessels, especially blast vessels, should be cleaned and examined internally as far as practicable once every twelve months; they should also be tested hydraulically once in every four years, and the amount of expansion of the vessel under the test pressure should be carefully gauged.

FLAME INTERCEPTOR.

Another recommendation made is that some device should be fitted for preventing the transmission of flame explosions along the compressed air pipes, and Fig. 21 shows a "flame interceptor" devised by Messrs. John Thornycroft & Co. for this purpose, and which they fit in both the blast and starting air pipes of Diesel engines. This consists of a cylindrical steel chamber 6 ins. diameter, 5 ins. long, and $\frac{3}{8}$ inch in thickness; the interior of the chamber is packed with a series of thin

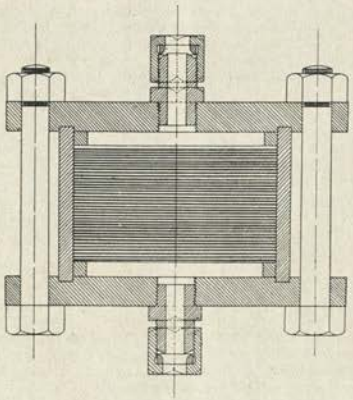


Fig. 21.

Flame Interceptor for Diesel Engines.
Messrs. John I. Thornycroft & Co., Ltd., Southampton.

perforated metal plates, soldered together near their edges, and held in place by distance pieces which come into contact with the steel covers of the chamber. The covers are $\frac{3}{4}$ inch thick, recessed on the inner side, to form a joint with the end of the chamber, the whole being held together by six $\frac{3}{4}$ inch bolts between the covers. The holes in adjoining perforated plates are staggered. Suitable unions are screwed into the centres of the covers so that the interceptor can be placed in a line of piping. If an explosion travels along a pipe and reaches an interceptor, the

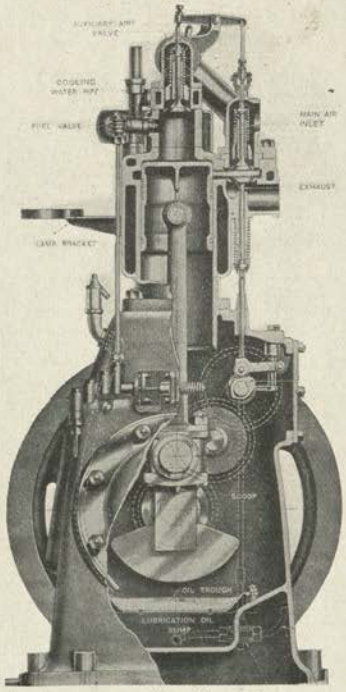


Fig. 22.

Cross Oil Engine.
The Westinghouse Brake Co., Ltd., London.
British Navy.

temperature of the gases will be reduced below the ignition point of any oil vapour by contact with the metal in the perforated plates. The large diameter of the intercepting chamber will also reduce the velocity of the gases passing through. It will be seen that the interceptor is of simple construction, and can be readily removed and cleaned when necessary.

In view of the considerable adoption of internal combustion engines for marine use, Lloyds' Registry of British and Foreign Shipping has been making an enquiry into the behaviour of the various oils used for lubricating purposes under the conditions of high air pressures at different temperatures. As the result of such enquiry they have communicated with the Home Secretary suggesting that an exhaustive investigation should be conducted in the matter.

THE CROSS OIL ENGINE.

Fig. 22 shows an oil engine with some novel features, and the system under which it works is such that the combustion is very good, and the engine is very flexible both in speed and power. It is known as the "Cross" engine, and is constructed by the Westinghouse Brake Co., Ltd., of London.

The chief patented system is that on the compression stroke the air is compressed into two chambers, one of which is cut off from the other. The fuel is injected into one of the chambers, and as soon as the piston begins to move down on its power stroke, the second chamber is up, and the hot compressed air in this chamber intermingling with the burning fuel adds oxygen to help the combustion. The ignition is by the heat of the combustion chamber and the heat of compression, so that a hot bulb such as is used in the ordinary two-cycle engines is not required. In addition, an air inlet valve is fitted to the combustion chamber, so that it is scavenged at each cycle.

This engine is of the vertical, single-acting, four-cycle type, and the whole of the moving parts are enclosed. It is constructed to use crude oils or residuals as fuel, but will work equally as well on ordinary lamp oils.

The principles on which it acts are as follows:—

The combustion chamber, into which the fuel is sprayed, is situated immediately above the cylinder, and has screwed into it

a small iron bulb, which is heated by a blow lamp before starting, and serves to ignite the charge for the first few explosions.

The piston, on the first down stroke, draws air alone into the cylinder, and on the return stroke the air is compressed.

Just before the piston reaches the end of the stroke, it cuts off from the combustion chamber an annular chamber or pocket. At or near the end of this stroke, and after the air pocket is closed, the oil fuel is sprayed into the highly-heated air in the combustion chamber and ignites.

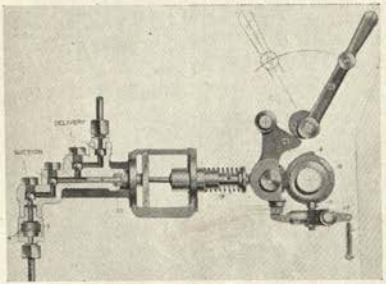


Fig. 23.
FUEL PUMP AND GOVERNOR.
CROSS OIL ENGINE.

When the piston has slightly moved down on its power stroke, the annular pocket or chamber, also containing heated compressed air, is uncovered, and the additional air, intermingling with the burning fuel, makes the combustion complete, and ensures economy and efficiency. Owing to this feature, the engine is exceptionally clean, and there is no smoke from the exhaust, or deposit of carbon on the valves or the cylinders. It is, therefore, possible to work for long periods without opening out the engine for cleaning purposes.

Just before the end of the power stroke, the exhaust valve opens, and is kept open until the end of the following up stroke, thus allowing the products of combustion to escape through the exhaust pipe.

The injection of fuel takes place at each power stroke, and the force of the explosion is varied according to the power required.

The fuel is injected in the form of a fine spray. It is not injected suddenly, but during a portion of the stroke. There is, therefore, no sudden explosion, but rather a gradual combustion of the fuel, giving a moderate but continued pressure on the piston, and avoiding a sudden and great increase of pressure at the beginning of the stroke. This method of working has the advantage that the running is smoother, and the bearings and other parts are not subjected to such severe stresses.

The speed of the engine is regulated by a governor, which varies the stroke of the fuel pump, so that the amount of fuel injected at each charge is proportional to the load.

Fig. 23 shews the fuel pump and governor, and it will be seen that there are four ball valves, two suction and delivery valves being employed in order to ensure that any slight leakage past one is checked by the other. The valve caps are so arranged that the lift of the balls does not exceed $\frac{1}{32}$ inch. A strainer is fitted below the suction valves containing layers of fine gauze to filter the fuel before it passes to the pump. The pump plunger passes through a gland and stuffing box which is packed with a special composition to prevent leakage of the fuel past the plunger. The spring serves to return the plunger after it has been forced inwards by the cam.

The lever shewn is used to pump a few charges into the combustion chamber before starting. When placed in the position shown by the dotted lines, the engine is stopped, as all movement of the plunger is prevented, and the fuel supply to the engine is cut off. The lever may also be used as a hand adjustment to vary the stroke according to the load by fixing it in an intermediate position by means of a fly-nut.

The engine illustrated is used for driving auxiliary air compressors for Diesel engines in oil-tank ships. It is of 10 H.P., and has a net weight of 1120 lbs.

The marine type of this engine is very similar to that shewn, and being very flexible it can be worked with a wide range of speed and power. This flexibility is arrived at by dividing up the air compressed in the cylinder into two parts, the fuel being injected into that portion contained in the combustion chamber, thus, smaller quantities of fuel can be ignited with greater regularity, and with more complete combustion, than would be possible if the fuel were injected into the whole of the air at one time. This feature constitutes a considerable advance in internal combustion engines for marine work, the

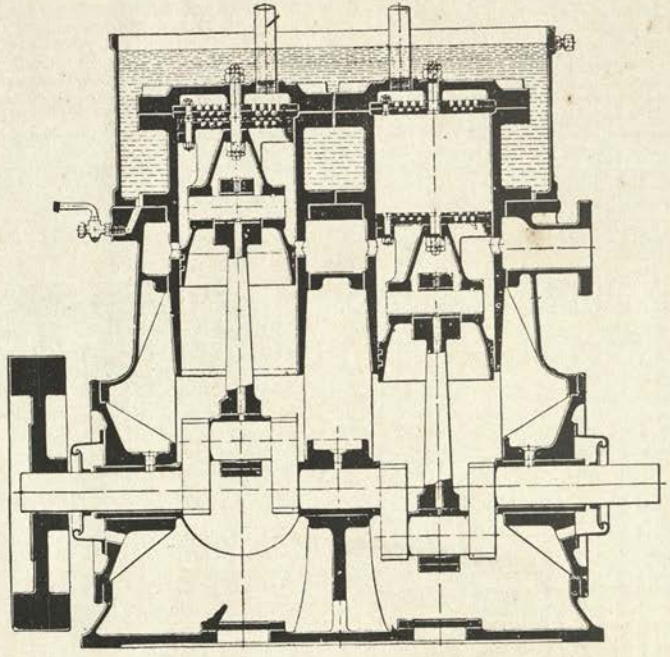


Fig. 24.
AIR COMPRESSOR.
ISAAC STOREY & SONS, LTD., MANCHESTER.
BRITISH NAVY.

range of speed and power closely resembling the flexibility of steam engines.

Engines of this type are made for marine service up to 120 H.P., the cylinders being four in number and the revolutions to give that power being 350 per minute. The approximate weight of the engine complete is about 7 tons.

AIR COMPRESSORS.

The tendency of the day to increase the running speed has also extended to air compressors, and the fact that so many are driven by electric motors has considerably contributed to such an increase. But as the speed increased troubles were found to develop with the valves, which were generally either piston valves or steel discs, and had the disadvantage that considerable clearance spaces were necessitated by their use, besides the wear and tear and consequent leakage through the piston valves, or the rapid wearing and liability to failure through fatigue of spring-closed disc valves. But the valve troubles have now been completely obviated by the introduction of Scott's patent ball valves.

Fig. 24 shows a two-crank compressor built by Messrs. Isaac Storey & Sons, Ltd., of Manchester, fitted with these valves, and it will be seen what simplicity of construction is obtained by their use.

The compressor has a frame and bedplate provided with bearings for the two cranks. The top of the frame has the inlet air passage cast in it, and the compressor cylinders provided with inlet ports round the circumference are fixed in bored holes in the frame. Each is fitted with a trunk piston worked by a connecting rod from the crankshaft, the annular part of this trunk piston being in constant communication with the inlet holes.

The form of the valve plates and the very small lift of the valves required to give full area, make it possible for the clearance spaces to be reduced to such an extent that the piston and valve plates practically touch.

The only parts requiring lubrication are the crankshaft bearings, the connecting rods and the trunk piston and cylinder walls, and all these are lubricated by splash lubrication in the enclosed crank chamber. The lower end of the trunk is fitted with rings to prevent the lubricant being drawn in with the air. By means of oil throwers, fitted at each end of the crankshaft, any oil which has worked through the bearings to the ends of the shaft is flung by centrifugal force on to the inner walls of the oil catchers, which are fitted on the end covers. The covers are provided with an oil drain at the lower side of the oil catcher, and the oil is thereby free to drain back into the crank chamber. By these means ample lubrication is ensured with satisfactory continuous running and extreme cleanliness.

A very efficient system of cooling is effected by completely immersing the cylinders in water, the casing being extended sufficiently high to allow the water to cover completely the topmost part of the cylinders. By this means, the whole of the air cylinder and cover is completely immersed in a large and freely

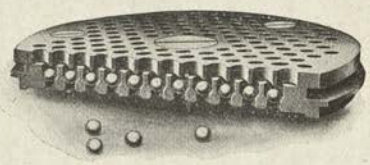


Fig. 25.

Scott's Patent Valves for Air Compressors.
Messrs. Isaac Storey & Sons, Ltd., Manchester.

circulating body of cold water, thus ensuring that the air is kept as cool and, consequently, as dense as possible during compression.

By draining off the water and removing the jacket, the cylinder joints can be easily examined, as all pipe connections are made in the body casing and not in the jacket.

All the working parts are readily accessible; the discharge valve plate, trunk piston, and connecting rod can be withdrawn through the cylinder, after removing the flanged cover of the discharge chamber. The valve plates can be examined from the top without removing the piston.

The chief feature of this compressor, however, is the patent air valves, which are shewn in Fig. 25 and which, it will be seen, are extremely simple.

The valves are in the form of hardened ground steel balls of small diameter, each working on a recessed drilled seating made from hard steel plates. The bottom plate it will be seen is drilled with a series of holes of two diameters, the top portion slightly larger than the ball, and the lower portion smaller in diameter than the ball. This forms a pocket, in which the ball works and a seat for it to rest on. The upper plate is fixed so that the holes in it come half way over the holes in the lower one, the solid bars between the holes in the upper plate coming directly over the centre of the balls in the lower plate, and so forming a stop for the lift of the valves. Both the delivery and suction valves and plates are of the same type, and can be easily examined or changed when necessary.

The upper side of the piston is fitted with a set of plates and ball valves, the air to the cylinders being admitted to these valves on the suction or down stroke and the positive and rapid opening of the valves is automatically ensured by the inertia of the balls at the commencement of the stroke. It will be observed that at the end of the compression stroke, when the piston commences its suction or down stroke, the rapid movement of the piston causes the inertia of the balls to pull them quickly off their seats and thus opens the valves at the precise moment desired. At the lower end of the stroke, the momentum of the balls instantly closes the valves immediately on the commencement of the compression or up stroke, which is exactly what is required.

It will thus be seen that a very large area through the valve plate is obtained with an extremely small lift, which is, in fact only about $\frac{1}{16}$ inch. This gives a high efficiency, and results in extremely durable valves and seats, without the use of either springs or other device.

Owing to the large outlet ports and valve chambers, in nearly all piston or disc valve types of compressors the clearance spaces are extremely large with the result that the efficiency is considerably reduced, but in this compressor there are no valve ports or chambers and owing to the design of the valves the cylinder clearance can be so small that the piston and valve plates practically touch, thus ensuring the highest possible efficiency.

It is found almost impossible to wear out the ball valves or seats, as the balls work round and keep themselves absolutely tight for any length of time, and, further, there is no liability to fracture or any other damage, so common in other types.

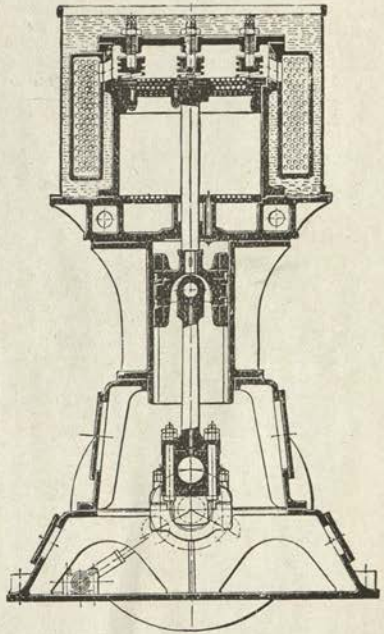


Fig. 26.

Inter-cooling Air Compressor.
Messrs. Isaac Storey & Sons, Ltd., Manchester.
British Navy.

For the larger sizes of this compressor, a three-crank intercooling type as shewn in Fig. 26 is generally adopted. This type is

admirably adopted for steady continuous running over long periods, owing to its extreme regularity of turning, due to the correct equalizing of the pressure relations in the three cylinders. These are mounted on distance pieces and body casing similar to those of a high speed engine. Two of them act as low pressure and one as high pressure, the arrangement being that by these means an equal division of power between the three cranks is obtained, and a much cooler delivery of air in consequence of the proportioning of the compressions between the high and low pressure cylinders.

The delivery valve plate, which is designed to secure a minimum clearance, is held down by strong springs from the outer cover. These springs act as a safeguard in case the connecting rod wears loose and the piston strikes the delivery valve plate, which, it will be seen, is recessed into the upper part of the barrel and forms the top end of the cylinder. With this safeguard it is thus possible to work the compressors with such a minute clearance as $\frac{1}{32}$ of an inch.

The air cylinder and intercooler are cooled by the totally immersed system previously described, the intercoolers consisting of a set of brass tubes expanded into tube plates in the ordinary way, but so arranged that the air is passed through the tubes on its way from the high to the low pressure cylinders, whilst the whole of the intercoolers are totally immersed in the cold body of water in the cooling tank.

All connections are made in the main frame, and by removing the water jacket the joints can be examined without difficulty.

This system of cooling and intercooling is found to be so efficient that the air is maintained at its maximum density throughout compression.

HYDRAULIC ASH DISCHARGER.

Fig. 27 shows the details of an underwater ash discharger known as the Palen-Burlingham type, and ash dischargers of this description have been installed on the U. S. navy colliers "Proteus" and "Nereus" by the Newport News Shipbuilding and Dry Dock Company.

The leading features of the design are shown in the illustration, and it will be seen that the ashes are discharged by means of an annular hydraulic jet of water supplied by a turbine driven centrifugal pump. The water jet forces back the sea water and creates a suction in the ash pipe which draws the ashes into the stream and they are carried overboard.

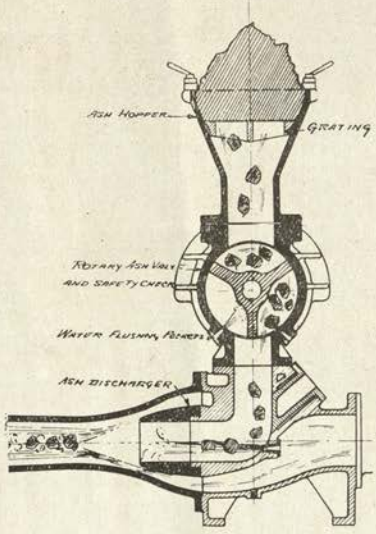


Fig. 27.

HYDRAULIC AIR DISCHARGER.

NEWPORT NEWS SHIPBUILDING CO., NEWPORT, NEWS, VA.

UNITED STATES NAVY.

The special form of hydraulic nozzle used in the dischargers produces a converging annular water jet that forms a solid stream beyond the nozzle. The discharge piping surrounding the water jet is made to conform to the jet, so the water passes through the contracted portion of the discharge in a solid stream.

The small water nozzle placed at the bend in the ash pipe produces a small stream which assists in keeping the horizontal portion of the ash pipe clear of ashes.

The rotating ash valve consists of a hardened cast steel rotor which is driven by a small double-cylinder engine.

The functions of the rotating ash valve are as follows:—

First:—The valve crushes the clinkers and all large pieces so they will pass the bend in the ash pipe, and it prevents long iron bars that will not go around the bend from passing.

Second:—The valve serves as a safeguard to the vessel and prevents an inrush of large quantities of water in case the pumps are shut down before the sea valves are closed or the hopper cover shut. No attempt is made to make the ash valve water-tight, on account of its service as a crusher, but it is partially tight and prevents serious flooding of the vessel while the sea valves are being closed in case of accident to the pump.

In actual operations on the colliers "Proteus" and "Nereus," the dischargers operated on a water pressure of less than 25 lbs. at the pump, and produced a suction of 18 ins. of vacuum in the hopper with the cover closed. One hopper will handle from twelve to fifteen tons of ashes per hour. This is as fast as the ashes can be forced through the grating in the hopper, with two men shoveling and one man standing by to poke the ashes in case they block on the grating.

For test purposes heavy clinkers and fire brick were thrown into the hopper, and the rotating valve ash crushed them readily, discharging them without difficulty. Bolts, nuts, and pieces of stone were carried outboard by the discharger quite as readily as light ashes, and the rotating ash valve and all parts of the engine are made heavy enough to withstand the strains produced when such materials get into the hopper.

CORROSION OF CONDENSER TUBES.

The Corrosion Committee of the Institute of Metals has continued its excellent work and its second report has now been issued, drawn up by Mr. G. D. Bengough and Mr. Richard M. Jones, who carried out the work.* A list of questions had been drawn up and circulated to engineers in charge of condensers, and much important information had been thereby obtained, amongst other points of interest were the following:—

(*a*) The extraordinary variation in the normal life of a tube, viz., from four to twenty-five years.

(*b*) The peculiar nature of the deterioration that resulted in the failure of the tube. In nearly every case the deterioration was due to dezincification, resulting in a rotten and pitted tube.

(*c*) The impossibility of correlating the failure of the tubes with the presence, or nature, of the electric lighting installation.

(*d*) The difficulty of connecting corrosion with any definite locality in the tube or condenser.

Careful search was made among the deposits in badly corroded tubes for carbon particles, but although about a hundred cases were examined no such particles were ever found.

As a result of the study of the answers to the question-schedules, and of the tubes corroded under conditions of practical work, the conclusion was come to that few deductions of importance could be made, and that this method of work was only of value for indicating in a general way the nature of the problem to be attacked.

The experimental plant which was erected in order to submit condenser tubes to conditions approximately, as nearly as possible, to those obtaining in ordinary practice in the mercantile marine has been productive of much useful information as to the best composition to adopt for such tubes.

The condensing plant consisted of four steel cylinders each holding twelve tubes 3 ft. long, and the trials were continued for nine months, the sea water being circulated through the tubes for nine hours a day for five days a week and half Saturday, remaining idle on Sundays. The vacuum maintained was always above 20 ins., and occasionally reached 25 to 27 ins., and the amount of steam condensed per hour per sq. ft. of condensing surface was approximately 5 lbs.

*Journal of the Inst. of Metals. vol. x., page 13.

Four standard types of tubes were selected as being the most suitable for detailed examination, their compositions being as follows :—

		Copper	Zinc	Tin	Lead
1	Ordinary Brass	70	30	–	–
2	Special Brass	70	28	–	2
3	Muntz Metal	61	39	–	–
4	Admiralty Brass	70	29	1	–

It seemed desirable to obtain a knowledge of the temperature in the interior of the condensers, so four thermometers were inserted in each casing in such a way that the bulbs were in actual contact with the top tubes, and these also served the purpose of enabling the four sections to be kept at approximately the same temperature by the adjustment of the amount of steam admitted to each.

At the end of nine months' working the plant was closed down, and three tubes of each composition were removed for examination. They were selected from similar positions in each of the four sections of the condenser, and after removal the tubes were cut in half longitudinally so that the interior surfaces might be examined.

In all cases the tubes were covered with a brown layer, which consisted chiefly of ferric oxide; it contained also sodium chloride and calcium carbonate, as well as traces of sulphate. This layer was loose and easily removed from the tube.

Beneath it a rather more adherent layer was found. This was greenish in colour, and contained both copper and zinc in the form of basic chloride and carbonate. In places small white spots or particles of zinc oxychloride replaced the green layer, and the tube underlying these areas was found to be dezincified. In the case of the Muntz metal tubes, the green layer was normally absent and was replaced by a very thin grey-white layer of zinc oxychloride. Beneath the layer of basic salts a layer of brown or black oxide strongly adherent to the tube was found in all cases. Investigation showed that the pitting found in some cases seemed to have been produced in the following way :—The zinc is removed from certain spots in the tube and leaves behind the copper in a loose, spongy and rotten form, and when dezincification has penetrated right through the tube and the copper has lost its backing of unaltered brass, it is quickly worn away mechanically.

The most important deductions to be drawn from the series of observations were as follows :—

(*a*) The order in which the tubes resist dezincification.–The most resistant were the No. 4, and the next the No. 2 tubes. These appeared to resist the action to about the same extent, and were considerably more resistant than the No. 1 tubes, which came next in order of merit. The No. 3 tubes were decidedly the most quickly attacked.

(*b*) The importance of temperature in corrosion phenomena.—In all cases the attack appeared to be most severe at or near the centres of the tubes. Since the steam entered the condensers at the centre and no baffle-plates were used, the tubes must have been subjected to the highest temperatures at their centres. It is believed, therefore, that temperature plays a most important part in determining the distribution of the areas of dezincification.

(*c*) Corrosion is not confined to the bottom of the tubes.—It usually occurred in that position, but was by no means confined to it. It frequently occurred along the sides, and occasionally along the tops of the tubes.

The importance of temperature was amply confirmed by these tests. In each of the four sets of tubes, the topmost were the most severely attacked, and these must have been the most highly heated. On the other hand, the bottom tubes of each set must have been subjected to a distinctly lower temperature than the others, and as a result the bottom tubes in two cases were not attacked at all, and in the other two cases the attack was less than that in the case of the upper tubes.

It is considered that the tests show that dezincification is due to a chemical action which becomes the more pronounced as the temperature is raised from the ordinary temperature to 50°C. and probably higher, and this action takes place under conditions which exclude the possibility of the settling on the tubes of any substance not derived directly from the tubes themselves.

Dezincification appears to be a phenomenon inherent in alloys of the brass type, and to be more pronounced the higher the percentage of zinc in the alloy. It starts at certain points on the tubes and spreads outwards from them, until in time the whole tube would become dezincified.

The report finally deals with the protection of condenser tubes, and states that the methods in use for such protection are electro-chemical in nature and depend either on the use of some metal such as zinc, iron, or aluminium or its alloys, which is electro-positive to brass, and which will consequently set up an electric current when both are connected together and immersed in sea water; or on the use of a dynamo to pass the current to the brass.

The metal zinc has been largely employed both for the protection of boilers and condensers. In the case of the latter, it is placed in the water-ends and is securely bolted to the tube plates. At first sight it would appear to be a more suitable metal than iron, since it is more electro-positive, but in practice this does not prove to be the case, and for the protection of the condensers it has been largely replaced by iron which is not only cheaper but more efficacious. The iron is used generally in the form of slabs, which are placed in the water-ends of the condenser, and are attached by bolts to the tube plates and it is of course necessary to ensure that the connection between the iron slabs and the tube plate be thoroughly satisfactory.

A very interesting series of experiments demonstrated the manner in which iron anodes can afford protection to the tubes over great distances from the anodes themselves. It was found that the greater part of the protecting current passes at first by the shortest path and protects only the parts near the iron anodes. These soon become covered with a layer of calcium carbonate, which greatly increases the resistance of that path; consequently the current passes to more remote but bare portions of the tube and covers them with the same film. The process is repeated, and the protecting layer of calcium carbonate creeps gradually along the tube. The extreme distance over which protection can be afforded in this manner is conditioned by the relative resistances of the layer of calcium carbonate and the increased resistance of the path of water through which the current must pass to reach the more remote parts of the tube. When the latter becomes greater than the former the protection will cease.

It will be seen that the part played by the film of calcium carbonate in electro-chemical protection is very important, and it even prevents, to a great extent, the initial step towards corrosion, viz.: oxidation of the metal.

The report says that the question may fairly be asked how can corrosion ever occur when iron slabs or an external current are used for protection, and the answer is that it can occur apparently in several ways :—

1. By the breakdown in the electrical connections between the slabs and the tube plates, and this may occur by the oxidation of the bolts, nuts, etc.
2. By mechanical injury to the layer of calcium carbonate caused by iron cleaning rods, passage of sharp particles through the tubes, etc.
3. By the failure of the calcium carbonate to adhere firmly to the tubes, especially if the latter has first undergone slight oxidation and corrosion.

The authors of the report consider that the precise conditions under which this film can be formed and maintained deserve further study, and that the importance of temperature in determining the nature of the corrosive attack on brass by sea water has not received from engineers the attention it deserves.

With the experimental condenser the temperature of the outlet water rose to 40°C. in hot weather, when only 5 lbs. of steam were being condensed per square foot of tube surface. The temperature of the hottest part of the tube rose under the same circumstances to 55°C. With ships trading to the tropics the temperature averages about 42°C., and of other ships about 36°C.

Some further valuable information relative to the matter as it affected war ships was contributed by Engineer Admiral Sir Henry Oram, Engineer-in-Chief of the British navy, in his address on assuming the presidential chair of the Institute, in March, 1914, when he gave an account of the different steps taken by the British Admiralty during the last 25 years in order to overcome the difficulties which had arisen in varying amount through that period.

He stated that prior to 1890 the condenser tubes in the British navy were made of the

70-copper 30-zinc composition, but owing to repeated failures of the tubes, the specification was in that year revised and the alloy altered by adding 1 per cent. of tin in lieu of 1 per cent. of zinc, the revised composition being 70 per cent. copper, 29 per cent. zinc, and 1 per cent. tin.

In 1891 the quality of the copper used was specified to be not less than 99.3 per cent. pure, while a little later tubes which were too soft were guarded against by a clause specifying that they should be stiff enough to stand the packing being screwed up tight enough to hold 30 lbs. pressure of water.

The specification was next amended so as to require tubes drawn from billets to be accurately bored and turned before being subjected to the final draws. It was found that in making the shells from which tubes were drawn, the bore was frequently eccentric, and often excessively so, and therefore the finished tubes were often thin on one side, although the total weight per foot was correct.

In 1901 some further tests were introduced, among others :—

1. A flattening test to one-half the original diameter without previous annealing.
2. Heating to a dull red heat without splitting.
3. Selected tubes to be sawn through and examined for internal defects.
4. The tubes to be drawn on a mandril.

In 1904 there was another revision of the specification, and the following stipulations were introduced :—

1. The amount turned off and bored out of the billets was to be sufficient to remove all surface imperfections.
2. The external diameter of the tubes to have a limiting variation of 0.005 inch.
3. The flattening test was reintroduced, $\frac{5}{8}$ in. tubes to be reduced to $\frac{1}{2}$ in. All tubes to be left 2 ins. longer than the required length, so that every tube could be tested.

In 1906 a new specification was issued which included the following :—

1. The copper to assay not less than 99.6 per cent.
2. Scrap to be limited to ends removed from tubes, and not to exceed 20 per cent.
3. Total impurities not to exceed 0.625 per cent.
4. The amount bored out of castings to be not less than $\frac{1}{4}$ in. of diameter.

This revised specification has held good to the present date with the addition that electrolytic copper may now be used.

In the year 1908, when the approximate number of condenser tubes at work at sea in the British fleet was 2,500,000, the number of failures of tubes occurring on service and reported were as follows :—Splitting 21 ; corrosion and perforation 69 ; total 90, or at the rate of 1 in 28,000 per annum.

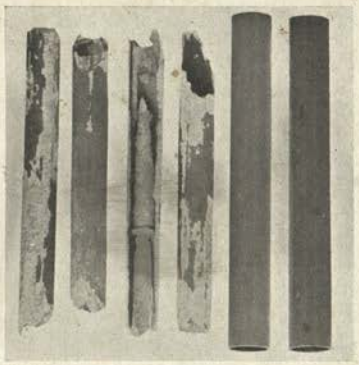
During the next five years there was a very considerable addition of new condenser tubes added to the fleet, and in the year 1913 the number of condenser tubes at work was approximately 3,800,000, and the total failure of tubes reported during the two years 1912 and 1913 were :—Splitting 16 ; corrosion and perforation 115 ; total 131, or at the rate of 1 in 60,000 per annum.

Sir Henry also states that in view of the number of failures of condenser tubes caused by corrosion and perforation by salt water where the circulating water passes through the tubes, close attention had been recently given to endeavours to eliminate the causes of these perforations. An incipient cause of some of the cases appeared to be the existence of original flaws or breakages of the inside surface of the tube and in the endeavour to eliminate such tubes the Admiralty have recently required a rigid internal examination. The result of this internal sighting has been to indicate defects in some of the tubes, and such tubes on being cut up have in a large number of cases revealed imperfections such as to justify their rejection, and which, if these tubes had been fitted in place, would probably have caused early perforation.

The experience of many years past has proved that besides the actual proportions of the metals forming the mixture, the method of mixing and manufacture has a great deal to do with the properties of the tubes to resist corrosion, and a striking example of this is shewn in the "Bemal" tubes which are now produced by the Yorkshire Copper Works, Ltd., of Leeds.

This firm commenced a series of experiments about six years ago, and eventually succeeded in producing tubes which seem to have a much greater resistance to corrosion than the ordinary tube. A good example of this is shewn in Fig. 28, the four tubes A to the left are of the alloy known as "Admiralty mixture," and composed of 70 parts of copper, 29 of zinc, and 1 of tin, while the two tubes B on the right are of the ordinary approved commercial alloy of 70 parts of copper and 30 of zinc, the difference being entirely one of a method of mixing and working the brass.

The corrosive test, of which the results are shewn, extended over a period of sixty-four weeks, the corrosive element used being a six per cent. solution of sulphuric acid. At the



A. B.

Fig. 28.

CORROSION OF CONDENSER TUBES.

end of this period the trial came to an end, by reason of the total failure and collapse of the tubes marked A, while the other tubes were practically untouched by corrosion.

These tubes are now in service in the United States navy and almost every part of the world, and the practical experience obtained with them bears out the results of such trials as above noted.

In many cases where they have been used to replace tubes in condensers which gave serious corrosion troubles before, such difficulties have been entirely overcome by the use of tubes made by the new process.

WARSHIP VENTILATION.

The endeavour to realize fighting efficiency has led to experiments being made with the ships more in fighting trim than has generally been the case, and this has led to the deficiencies in the present method of ventilation and air supply to the compartments below the waterline being made very evident, so much so, that it is very certain that it would be impossible for most battleships to endure a long combat with the vessel in what is designed to be the actual fighting trim.

The attention that has been forced to this subject has also led to the question of ship ventilation generally being investigated with the result that the old ideas which obtained in such matters have been altogether upset and the usual systems of ventilation considerably modified in the latest vessels.

A valuable addition to the literature on this subject has been a paper recently contributed to the U. S. Naval Institute at Annapolis on the ventilation of modern battleships* by Naval Constructor R. D. Gatewood and Surgeon Charles M. Oman, and which explains the special difficulties met with in providing good ventilation in a ship-of-war, and the methods now adopted in the United States navy.

In dealing with the sources of vitiation of the air it is pointed out that from a hygienic point of view the most undesirable feature of the air found on shipboard is its high temperature. This heating of the air is largely unavoidable on account of the large number of heat sources on board and the fact that the vessel being of metal readily conducts the heat of the sun. A considerable quantity of the heat generated is wasted through the exposed surfaces of bulkheads, pipes, and machinery, and it is necessary to reduce this as much as possible. It is not only undesirable of itself, but produces harmful draughts and the so-called "sweating" of the metal of the ship's structure. The shell plates of the vessel are in contact on their outside with cold sea-water and on their inside with warm air. The air in immediate contact with the

* U.S. Naval Inst. Proceedings. 1913. Vol. 39, page 993.

inside of the shell-plates being much cooler than the surrounding air on account of the fact that the metal so readily conducts the hot air from it into the cold water, allows its water to be condensed and deposited on the inside surface of the shell. This water is, of course, very undesirable from point of view of corrosion of the metal, but it is also a highly undesirable thing from a hygienic point of view, because it is actually largely water derived from the exhalation of the lungs and skin, and should have been carried out of the vessel by the system of ventilation.

In addition to the temperature, the air contained within a vessel is modified by the nature of the stores on board and by the men who are on board. The modification affected by the men can best be appreciated from the statement that a crew of 1000 men actually add by way of the lungs to the contained air of a ship some 2000 pounds of carbon dioxide per day, of which 560 pounds is carbon. In the same way they add about 620 pounds of water.

It is also pointed out that the question of diffusion is a most important one, and this importance is not always appreciated by those concerned in the designing of ventilating systems.

Great attention must be given to the point that all compartments furnished with supply must also be furnished with means for exhaust and *vice versa*, for in many cases the designer is often largely concerned with supplying a certain volume of air to a compartment, and is not so greatly concerned as to the method of distribution of this air in that compartment. It is not so much a question of the supply of air as one of proper diffusion or circulation of air.

Until recently in the United States navy the amounts of air supplied to a given compartment were based on a factor known as the "rate of change," that is, the amount supplied was to be based on changing the total air in the compartment once in a certain length of time, which varied from one to thirty minutes, and this "rate of change" was determined from experience on all battleships thus far constructed.

The present practice is to investigate the quantity of air required for each compartment based on the rate of change as determined by experience for similar compartments in previous vessels, and simultaneously investigate the amount of air required based on the number of occupants of the compartment and the character of the work customarily performed in that compartment. From these two, that one is selected which calls for the largest amount of air. This quantity is further modified as considered necessary by reason of proximity to excessively hot compartments or to the outside plating of the ship.

In laying out the detail plans of ventilation piping, the size of mains and branches and the pressures and velocities of air are based on certain standard instructions issued by the Bureau of Construction and Repair as the result of extensive experiments conducted by Naval Constructor Taylor, at the Experimental station at Washington.

The standard conditions which have been adopted for supply mains are a pressure of five pounds per square foot in the moving air at the inlet of the main or outlet of fan, and a velocity of 2000 feet per minute. The fan is to be capable of maintaining this pressure on the delivery side whatever the pressure may be on the inlet side. This pressure of five pounds per square foot is for standard conditions of air, density at 70°F. and a relative humidity of 70 per cent. Under these standard conditions a cubic foot of air weighs .07465 pound. The pressure of five pounds is equivalent to a pressure head of 67 feet of standard density air and a velocity of 2000 feet per minute corresponds to a velocity head of 17.27 feet. The total head then, against which air is to be delivered to the supply mains is 84.27 feet, which is found to constitute a very suitable combination of velocity and pressure head, giving a delivery close to the maximum possible for the total head.

As it is impossible to avoid loss of total head along the duct, due to friction, with resulting loss of delivery from the standard, it is necessary to make up this loss, and a series of formulae have been provided based on practical experience by which the head at each outlet can readily be determined.

As stated above, the standard conditions in the main at the first outlet are five pounds pressure, and 2000 feet per minute velocity. As the branches lead off the size of the main is not changed until sufficient air has been removed to reduce the velocity to a value between 1200 and 1500 feet per minute, the mains are then contracted with a taper of one and a half inches to the foot until the area is so reduced that the velocity again becomes 2000 feet per minute. This contraction is repeated whenever necessary, but the final diameter of the main is not to be reduced to less than twice the diameter of the last branch.

The ventilation of the engine and boiler rooms is treated quite separately and in a different manner, being based largely on experiences with previous ships. This has recently brought out the great importance of proper circulation of air, and it has been definitely proved that men can work in an absolutely closed compartment, provided that the air is kept circulating by means of fans, for a longer time than if only a small supply and exhaust of fresh air were provided. The result of the experiments made is considered to be of much value, in connection with providing suitable ventilation for such spaces as central stations, conning towers, and other small important battle stations into which air is now drawn through supply pipes into which smoke would certainly be drawn in time of action.

This is a matter of great importance for when a shell containing high explosive has burst against the armour or the funnels have been perforated above the armoured deck, the vessel will be enveloped in an atmosphere of noxious gases or of the products of combustion which will be delivered by the fans to the compartments below in sufficient quantity to overcome the men working in them.

There is no doubt also that the present unsatisfactory conditions of ventilation in many engine and boiler rooms would be greatly improved by the provision of fans for circulating the air in these compartments; for it is found that it is not so much the heat in the engine rooms that knocks the men out as it is the fact that the air is not kept circulating.

An interesting result of the scientific investigation of the effect of circulation of air is the introduction of the intermittent fan shewn in Fig. 29 and constructed by Messrs. Keith & Blackman, of London, which has been designed to avoid the strong persistent draughts given by the ordinary class of fan.

The intermittent fan automatically creates breezes which gradually rise to a maximum and fall away to nothing about four times a minute, and the contrast between the time when the breeze is at its strongest and when it has fallen away to nothing is so marked that the breeze does not require to be as

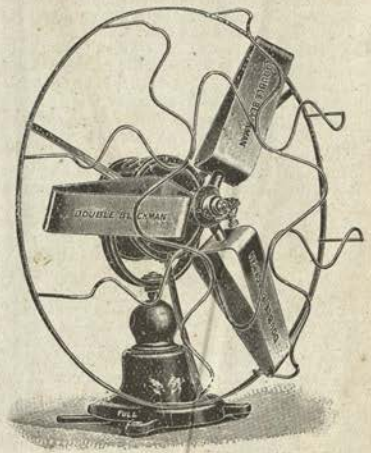


Fig. 29.
INTERMITTENT FAN.
MESSRS. KEITH & BLACKMAN, LONDON.

strong as is necessary with persistent blast fans.

In closed compartments the effect is most marked, and when the air in such is becoming stuffy and close, causing a depressed feeling, the result of an intermittent fan being put in motion is to induce currents which are constantly on the move, without however, persisting in blowing in any particular

direction, and they thus restore the atmosphere to a healthy and invigorating state, which quickly communicates new vitality and buoyancy to those within the compartment.

An oscillating fan has been found to do this to a certain extent, but as the draught it induces is of constant strength, the ultimate effect is very different. In the case of the new fan, each breeze created by it rises gradually in intensity and drops away again to nothing, thus having exactly the same effect as natural breezes. The fan is so arranged that the breezes can be obtained in one direction only or in both as may be desired, and the frequency of the breezes is also controllable.

REFRIGERATION PLANT.

A kindred subject to ventilation on board is that of cooling and refrigeration, and the refrigerating machinery on board a ship of war has now become one of the more important auxiliary plants. Of the various types employed for this purpose, the CO_2 gas machine has rapidly come into favour for many reasons. As a competitor, ammonia has so many disadvantages when the safety of the ship's personnel is considered that it may be practically left out of account. Other systems have also been tried based on the evaporation of water, but these though reasonably successful when only a moderate fall of temperature is required, fail in those cases where it is desired to reach temperatures much below freezing point.

The chief use of the refrigerating plant on board a vessel of war is to reduce the temperature of the magazines, and since the disastrous results occasioned a few years ago in certain navies by the decomposition of explosives, it has been found of the highest importance to keep the charges at as equable a temperature as possible and somewhere in the neighbourhood of 70° Fahr.

The low temperatures having been obtained by the liquefaction and (after cooling) subsequent evaporation of the CO_2 gas, the next step is to determine how best to apply the cold thereby at disposal for the elimination of the heat in the air of the magazines. Brine grids might be employed in the same way that they are in the holds of large merchant vessels when the preservation of cargoes at a low temperature is the object sought. This plan was tried in some of the earliest installations, but proved to have many disadvantages, and it is found better to pass the cold brine through the tubes of an air cooler placed in close proximity to, and preferably above the magazine which the machine has to serve. The cold brine being constantly circulated inside of the tubes by the brine pump which forms part of the plant, the air from the magazine is propelled by an electric fan against the outside of the tubes.

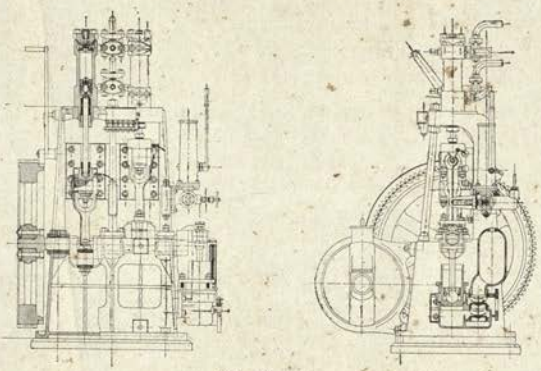


Fig. 30.
Refrigerating Machine.
Messrs. Seagers Ltd., Dartford.
British Navy.

A constant circulation is thus set up, since the air vents and passages from the magazine to the fan form a closed system. If the passages and ducts of air are sufficiently insulated there is but little loss due to passage inwards of heat from the surrounding parts of the ship's structure; the only real loss is due to the necessity of changing the air of the magazines occasionally and admitting outside air from the atmosphere and this being more or less charged with vapour a certain amount of heat has to be eliminated from it to throw down and condense the same.

The compressors of the CO_2 machines are now generally driven electrically on large ships, and Fig. 30 shows such a machine constructed by Messrs. Seagers, Ltd., of Dartford, England, who have given much attention to the problem of producing an efficient light machine for warship purposes combining accessibility with small compass and a minimum of weight.

The machine shown is of their single acting type with twin compressors at 180°, the motor is placed on the front of the frame sufficiently low down to make the cranks, crossheads, etc., quite accessible and yet do away with the grave defect in a machine of this type of placing the motor at the back. The compressors are cut from the solid steel forging and all the valves of hardened steel are of an interchangeable pattern. The condensers and evaporators in these larger machines are always separate units, enabling them to be stowed in the most convenient positions in the very restricted spaces which are generally the only ones available.

The particular machine illustrated is built for the magazines of one of the largest existing battleships; there are four such units connected together by a common brine system, so that in the case of need any machine can be worked on any one of the ship's magazines. For the service of the ship's provision rooms and for making ice it is usual to fit a machine in every respect interchangeable with the other units and which can in case of necessity take their place, but which in the ordinary way is kept exclusively at work on a separate brine system working at a much lower temperature.

In the case of those navies whose vessels are likely to be stationed in hot climates, it has been found advisable to fit cooling plant for the magazines also in the smaller vessels, and especially those of the t.b. destroyer class.

As such machines are necessarily small, it is a great advantage to be able to work the magazines with brine at a fairly high temperature, say above freezing point, and yet at the same time be making ice for the ship's use.

Fig. 31 shows a machine well suited for this purpose which Messrs. Seagers have fitted to several vessels of the Destroyer and Scout class. The CO_2 condenser forms part of the framing, while the evaporator, which is built immediately at the back of the machine, constitutes at the same time an ice tank, the ice moulds being introduced in the centre of the coils.

When making ice, the brine in the evaporator must of course be at a temperature sufficiently below freezing point. The circulating pump which draws the brine from the ice tank or evaporator and pumps it into the air cooler of the magazines can be so regulated as to draw just the requisite amount of cold brine to maintain the brine system in the air cooler at about 34°, thus the two operations of cooling the magazines and making ice may be going on simultaneously.

The air cooler used in combination with the machine just described is of an exceedingly light and compact pattern. The fan for circulating the air from the magazines is mounted on the cooler frame as shown in Fig. 32, and the whole being contained in a framing of polished teak and planished Duralumin forms a handsome fitting to place in proximity to the Officers' quarters, if these come immediately over the after magazines, as is now generally the case.

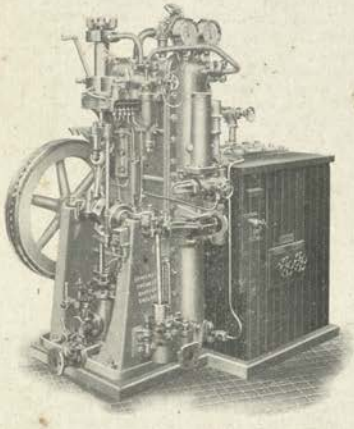


Fig. 31.

Refrigerating Plant for Destroyers.
Messrs. Seagers Ltd., Dartford.
Chilian Navy.

In the machines just described, the whole charge of CO_2 gas drawn in through the suction valve by the compressor piston is, after compression, expelled through the condenser coils and the expansion valve into the evaporator, where, after being expanded down to the temperature and pressure of the evaporator, it is again drawn through the suction valves of the compressor and the cycle repeated.

The temperature to which the liquified gas is cooled in the coils of the condenser depends on the temperature of the sea circulating water, and when the latter is abnormally warm the capacity of the CO_2 machine falls off very materially; for instance, a machine which is rated as capable of eliminating 100,000 B.T.U.'S with 55° cooling water, falls to 60,000 B.T.U.'s with 85° cooling water and 0° brine. In other words, if 85° cooling water has sometimes to be used, the machine must be of 66 per cent. greater capacity than would be the case were the water always at 55°.

This falling off is due to the very small latent heat of CO_2, for a very large portion of CO_2 gas has to be formed after passing the expansion gas in order to cool the CO_2 itself from the condenser temperature down to that of the evaporator.

The amount of gas thus formed, and consequently wasted as far as refrigeration is concerned, is as follows, with the evaporator temperature at minus 10° Fahr. :—

With CO_2 to the expansion valve at 92°, 50 per cent. gas is formed.

With CO_2 to the expansion valve at 52°, 25 per cent. gas is formed. Thus with 92° CO_2 at the expansion valve, just half is in the form of gas before it enters the evaporator.

All this gas has to pass through the evaporator at minus 10° and has to be compressed again to the condenser pressure without any refrigerating benefit whatever being derived from it.

Now on board a warship it is just when the ship is in tropical or subtropical waters and the circulating sea water is at these high temperatures that the cooling of the magazines becomes of the greatest importance. So that at the very moment when the machine is required to be doing the largest amount of work, there is a great falling off in efficiency.

To combat this difficulty inherent to all refrigerating machines on the compressed gas principle, Messrs. Seagers have recently introduced into their machines for the first time in England what is known as the Voorhees or M.E.C. system (Multiple Effect Compression).

The general principle of this system may be described as a compressor that takes in suction vapour at two or more different suction pressures during the suction stroke, the high pressure vapour mixing with and compressing the low pressure vapour up to its own pressure, so saving some of the power that would otherwise have been required, and giving a much greater capacity for refrigera-

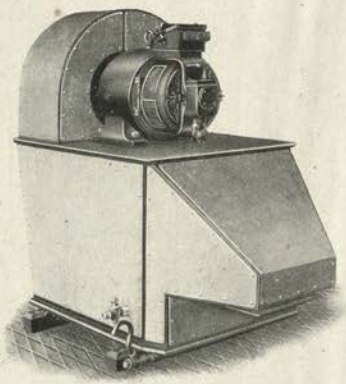


Fig. 32.

Air Cooler for Destroyers.
Messrs. Seagers Ltd., Dartford.
Chilian Navy.

tion, because of the greater weight of vapour pumped per stroke of the compressor.

In this way a very large portion of the gas does not enter the evaporator, and therefore—

(*a*) The range in pressure is greatly reduced and the power required is consequently lessened.

(*b*) As this gas is never reduced to the evaporator temperature, a less percentage of liquid has to be wasted in reducing its temperature.

The introduction of this system involves the following alterations to the usual parts of a normal plant :—

(1) A vessel called the multiple effect receiver to act as a separator of the gas and liquid after it has passed the first expansion valve.

(2) A second expansion valve, automatic in its action, in connection with the above vessel.

(3) A mechanically operated valve, for admitting the gas from the receiver into the compressor at the end of the suction stroke so as to give multiple effect compression.

The addition of these parts does not increase the space taken up, the weight is but slightly added to, and the size of the machine both as regards compressor and prime mover being reduced for a given output, the first cost is not increased.

Experiments with the improved machine show that the cooling effect has been increased by 100 per cent. with an expenditure of 40 per cent. more power, and there is no more difficulty in operating it than with the old type.

It will be seen that the advance is a most important one, and the best proof of the success of the system is that the very largest refrigerating plants in the world are being built on this plan, the results therefore of its introduction on board ship are being looked for with great interest.

* * *

Fig. 33 shews the combined steam-driven type of machine as fitted in some of the t.b. destroyers for the Brazilian navy, by Messrs. J. & E. Hall, Ltd., of Dartford. It is of their standard type with its condenser and evaporator contained within the frame, and has a compressor of forged steel of the double acting type and driven in tandem by the steam cylinder. The brine circulating and the sea water or condensing pump are driven off the tail end of the connecting rod.

The machine illustrated is found very suitable for t.b. destroyers and other small craft during service in home waters. It cools the small ammunition rooms of which there are generally two, one placed forward and the other aft, keeping them at a temperature of

about 70°Fahr., it maintains the two provision rooms at the two different temperatures required, and makes about half a hundredweight of ice at a time. In the ammunition spaces the cooling is done by a blast of cold air generated in a special air cooler consisting of a battery of brine-pipes or coils, while the provision rooms are cooled by means of brine-pipes fitted against the ceiling or sides of the chambers.

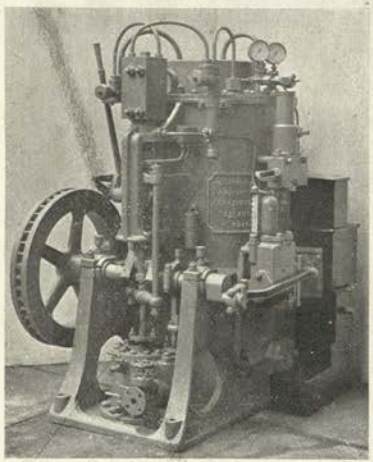


Fig. 33.

Refrigerating Machine for Destroyers.

Messrs. J. & E. Hall, Ltd., Dartford.

Brazilian Navy.

Messrs. Hall have lately introduced a special air cooler which has proved very efficient. It consists of brine coils closely nested together, the arrangement being such that the air gets into very intimate contact with the surface, and the moisture condensed on the coils is separated automatically.

The tendency to drive all auxiliary machinery electrically has of course been felt also on such craft as t.b. destroyers, with the result that many of them have the compressors driven by a motor. But in a ship of this size it is far more logical to use steam for the purpose, and not to convert steam power into electricity for the purpose of driving a compressor with reciprocating motion by means of an electric motor with circular action. It appears, however, that this is now being generally realized, and the latest installations are being steam driven.

The necessity of good insulation is even yet hardly sufficiently realized in warship work, but it is a matter of the greatest importance and it seems foolish having obtained the cooling effect not to make the best possible use of it. Three inches is about the standard thickness for magazines, but four and even five inches thickness is required for particularly hot spaces. Slab cork is found to be the best and most handy method of insulation, and when fixed in place is covered with special waterproof cement. The insulating lining of the provision rooms is generally six inches and finished off in a similar way.

BOAT DISENGAGING GEAR.

So much attention has been given of late to the question of instant readiness of boat-lowering gear that it is interesting to note that the British navy has now decided in favour of the boat-releasing gear made by Messrs. H. E. C. Robinson & Co., Ltd., of Chiswick, London, as the regulation fitting, and the Common Hook of the same makers is the only fitting to be used for the boats at davits not fitted with releasing gear.

The disengaging gear itself is shewn in Fig 34, and has been adopted after long and exhaustive trials at sea and in competition with many other gears. The requirements insisted upon in the British navy are as follows:—

1. Engagement must be by a plain hook of ordinary form, which even the least experienced can see and understand.

2. There must be no obstruction to hooking on by hand, nor to unhooking by hand, if that in any special case should be desired.

3. The hook must be perfectly moused against accidental unhooking. The boat must be safe if left lying alongside without safety pins and lifting by a wave must not release it.

4. Release must be equally certain whether the vessel is going at high speed or is stationary, or has astern way, and added weight in the boat must only help, and not add resistance to the releasing action.

5. The releasing action must not only make it certain that both ends release

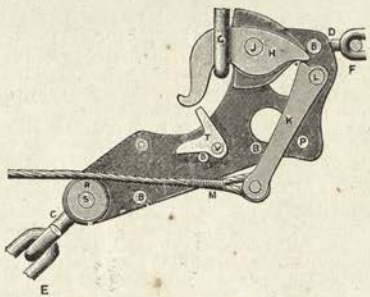


Fig. 34

Boat-Disengaging Gear.

H. E. C. Robinson & Co., Ltd., Chiswick, London.

British Navy.

together, but that release must be equally easy whether the boat is still suspended or is water-borne.

6. Release must be by letting go a line (held by a turn round the thwart or cleat) not by pulling a line or moving lever, which may be pulled or moved accidentally.

7. The releasing tackle and all the gear must be above thwart level in sight of every one, and out of reach of accidental or unseen obstruction.

Referring now to the illustration, the hook is shewn with one side plate removed so as to explain the method of working.

A is one of a pair of plates forming the frame of the gear, which are held together at about an inch apart by shouldered rivets BB, the latter serving also as stops for the working parts.

C and D are shackles for connecting the frame with the chains E and F which are attached to the boat.

G is a ring shackle attached to the lower block of the lowering tackle, which engages with H.

H is the tumbling hook.

J is a pin upon which the tumbling hook H is pivoted. This pin, which also carries the shackle D, takes the form of a double-ended eye bolt, to the eyes of which the steadying lines are attached.

K is a lever pivoted in such a manner that its short ends engage with the tumbling hook H, and prevents the hook from revolving, by direct pressure against it; the long end of the lever is held to its work by means of the direct pull of a short piece of flexible wire M.

L is the pin upon which the lever K is pivoted.

M is a short piece of flexible steel wire rope, connected by a shackle with a light chain N, which runs fore-and-aft above the thwarts. The chain is divided by a single purchase, the fall O of which is let go by the coxswain when he desires to release the boat, with the effect of allowing the hook H to revolve on the fulerum pin J.

P is a safety-pin which secures the lever K and therefore the hook when it is desired to dispense with the use of releasing gear; also for locking the gear after the boat is secured at davits.

R is a sheave, running on the pin S, to lessen friction upon the wire M.

T is a small tumbler which serves to mouse the hook against accidental unhooking. It turns loosely on the pin V, and remains by its own weight, either in the position shewn or thrown over to the right. In whatever position it is placed it does not interfere with hooking on or with slipping; and it can be instantly thrown back if it is desired to unhook by hand.

Another form of hook is made for use in cases where there is insufficient room (behind the hook) for the free working of the lever K or where it is necessary for other reasons to raise the hook higher in the boat. In this

case the eyes for the attachment of the steadying lines are on the ends of the pin S :— i.e., at the bottom of the gear instead of at the top, so as to raise the gear in the boat, but the slipping action in both types is exactly similar and the moving parts are interchangeable.

Fig. 35 shews a common hook not arranged for slipping, as this is not considered necessary by the British Admiralty for boats intended

Fig. 35.

COMMON SUSPENSION HOOK FOR BOATS.

H. E. C. ROBINSON & Co., LTD., CHISWICK, LONDON.

BRITISH NAVY.

to be lowered infrequently and when the vessel has no way upon her. It will be seen that the hooks are extremely simple in form and do not require to be held up by hand; the man who hooks or unhooks can use both hands in manipulating the ring and the hook takes care of itself. It is also perfectly moused against accidental unhooking. For intentional unhooking the mousing is thrown out of action by a touch of the finger and when it is in place it offers no obstruction to hooking-on. This arrangement of mousing is somewhat similar to that of the releasing gear. The type of hook shewn is suitable where the boat is suspended by keel-bolts, and shows the hook in section.

T is a mousing tumbler resting by its own weight in either position and is easily put in or out of action by moving the end of the arm V. In the illustration it is shewn out of action. Other types are employed where the boat is suspended from the extreme ends, or where chain slings are used.

THE HELE-SHAW TRANSMITTER.

Much attention has been given to hydraulic transmission for some time past, and as experience is gained in its use its field of usefulness is ever increasingly extending. As long as the steam engine remained practically the only prime mover the want of such transmission was not seriously felt as the steam engine itself is a very flexible form of motive power, but the ever increasing use of electrical motors and internal combustion engines has brought more and more into evidence the necessity of a flexible means of transmission when a considerable variation of speed and effort is required in the application of power from a prime mover of limited flexibility. Besides these cases there are also those where although the prime mover in itself may be sufficiently flexible, still in order to obtain the greatest economy possible from it, it is desirable to maintain its revolutions at a fairly constant speed, while the organs to which the power is transmitted may require a very great variation in the number of its revolutions to enable it to carry out efficiently the work for which it is intended.

One of the first apparatus of this description was the "Universal Transmitter,"* which has been utilized for many purposes with excellent results, but the latest type of hydraulic transmitter, invented by Dr. Hele-Shaw, F.R.S., has completely overcome certain defects which manifested themselves in the earlier apparatus of this description. This transmitter is of the rotary plunger type and its operation will easily be understood from the following description :—

*See "Fighting Ships," 1909, page 475.

Figs. 36 and 37 shew diagrammatically a section through the centre of the pump at right angles to its axis.

AB is the line along which stroke variation takes place. C is the cylinder body in which

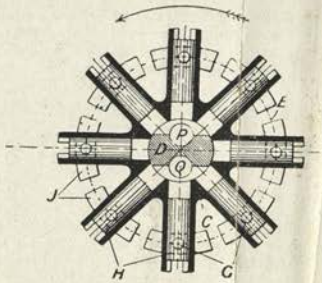


Fig. 36.

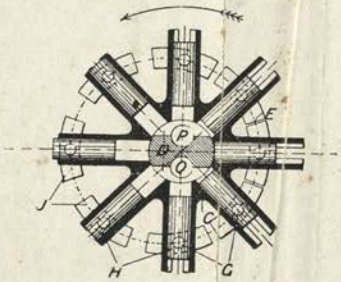


Fig. 37.

THE HELE-SHAW PUMP.

are formed a number of radial cylinders and this cylinder body is coupled to and driven by the prime mover employed. D is the fixed central valve on which the cylinder body revolves, and in which are the suction and delivery ports P and Q, communicating with the outside by passages.

The radial cylinders are fitted with pistons H, through each of which, parallel with the axis of D, is a gudgeon pin G. On these gudgeon pins are slippers J, fitting in an annular groove and causing the gudgeon pin centres to travel in a circular path E shewn in dotted lines; the position of this path can be changed by moving its centre along the line AB.

Suppose the cylinder body to be rotating in the direction of the arrow, and the position of the circular path E to be such that its centre coincides with the centre of D as in Fig. 36, no radial motion is then communicated to the pistons.

If the position of the centre of E be now moved to the left as in Fig. 37, the pistons as they pass above the line AB recede from D and suck liquid through the port P, whilst the pistons below AB approach D and discharge through port Q, while if the position of the centre of E be in the opposite direction to the right, then the pistons below AB recede from D, so that Q becomes the suction port, and P the delivery port. The flow of liquid is therefore reversed without altering the direction of rotation.

In moving from the position of maximum delivery on one side to that on the other, the discharge is gradually reduced until at the central position it ceases, after which it again increases to the maximum in the opposite direction, the change from full forward to full reverse discharge being made without shock.

The slippers J traverse the whole surface of the path E once each in revolution, and their resistance at high speeds of revolution would be large even if perfectly lubricated by running in a case full of oil. Further, the oil filling the case would be churned by the rotation of the pump and increase the resistance.

To decrease this resistance and thereby increase the efficiency of the pump, the path E is formed as part of a floating ring which runs on bearings. This is made clear in Fig. 38 which gives view of an actual pump in outline. In these figures the lettering used has been adhered to for similar parts.

It will be seen that two more parts are indicated in this illustration which are :—

F the floating ring.

R the ball roller bearings on which this revolves.

The action of the pump is exactly as described previously, the revolving cylinder body C carries the pistons H, their gudgeon pins G, and slippers J round with it, the slippers in their turn cause the floating ring F to revolve on the bearings R, the resistance of the slippers in the annular groove being greater than that of the bearings R.

The slippers approach and recede from one another in each revolution by an amount equal to the stroke of the pump, there being no relative motion at the no stroke position.

The floating ring F is made in the form of a drum, the oil leaking past the pistons is retained by centrifugal force as an annulus to lubricate the slippers and gudgeon pins.

All the forces in the pump being in the plane of rotation, there is no end thrust and a small end float can be allowed.

It will be seen that all the parts are simple, and only those which are cylindrical require making with any great degree of accuracy, and by using oil as the working medium all parts are properly lubricated and no wear takes place.

There are three valuable properties which this transmitter possesses, namely :—

(1) Uniform and steady discharge under all pressures, (2) Balance, and (3) Durability.

The uniform discharge can be seen at once by the absolute steadiness of the pressure gauge at all pressures when the pump is working, notwithstanding the fact that the working oil is practically incompressible, and that the pump has all the advantages of the positive or plunger type. This is the direct result of the small stroke and high speed which factors are only compatible with high efficiency owing to the operation of the fundamental feature of the pump, namely, the floating ring.

The next property, namely, the balance of the pump, makes it possible to run the pump without vibration at a high speed of revolution and without introducing balance weights. This balancing is due to the fact that although the eccentricity of the pump is essential for its work yet the parts eccentric to each other *both revolve about fixed centres*, namely, the centre of the floating ring and the centre of the "D" tube or central valve respectively. Although these centres must be relatively adjustable in order to produce a change in the volume required, yet they are fixed as far as the revolving parts are concerned.

As regards durability, it is a remarkable fact that pumps in operation for several years shew little if any signs of wear. This is largely due to the fact that oil is the working fluid employed and that the nature of the contrivance is such that the working load can only increase by increasing the pressure of the oil ; thus a method of automatic forced lubrication is provided which prevents injurious metallic contact of the working parts.

It should also be noted that in general there is no packing of any kind, and that the fit of the working parts is amply sufficient to ensure a minimum amount of leakage ; what leakage takes place is simply returned again into the working system, so there is no loss from this cause and what returnable leakage does take place merely ensures effective lubrication.

One of the uses for which the Hele-Shaw transmitter has been adopted is for steering gear and for which it has proved admirable.

An experimental set was installed in the steam yacht "Albion," a vessel of 1700 tons and fitted with turbine engines of 2000 H.P., the results with which were given in detail by Dr. Hele-Shaw in 1911.*

One of the first sets was fitted in the twin screw steamer "Orama," a vessel of 12,930 tons and its satisfactory and economical working has led to its adoption in many other vessels.

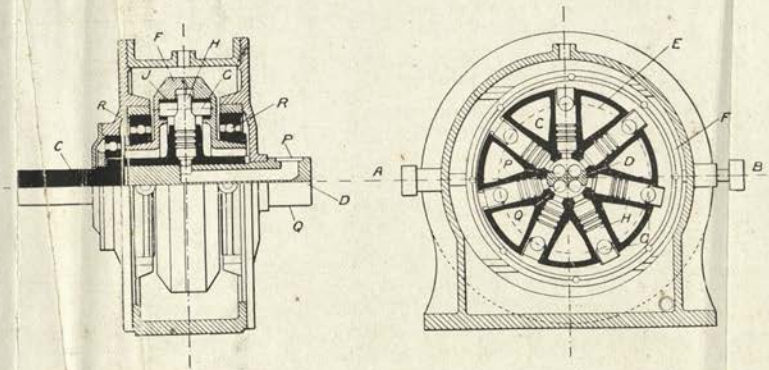


Fig. 38.

THE HELE-SHAW TRANSMITTER.

MESSRS. COMPAYNE, LTD., LONDON.

The steering gear is constructed by Messrs. John Hastie & Co., Ltd., Greenock, and the arrangement adopted in the "Orama" is shewn in Fig. 39.

It will be seen that the steering gear is of the type in which the two rams are in line with and opposed to each other, the ram cylinders being on opposite sides of the pump and motor

A is the tiller fixed to the rudder stock. B1 and B2 are the hydraulic cylinders and rams operating the tiller A by means of a crosshead ; C is a Hele-Shaw pump ; D an electric motor and E is the spindle controlling the operation of the pump C.

The arrangement is such that in the mid position no flow of liquid takes place, although the pump is running ; if the spindle E is pushed towards the pump, liquid flows from pipe F1 and cylinder B1 and down pipe F2 to cylinder B2. Should the spindle be pulled out liquid flows from pipe F2 and cylinder B2 and down pipe F1 to cylinder B1.

G is a floating lever coupled approximately at its middle point to spindle E of pump and H is a lever operated from the telemotor or control shaft at one end of floating lever.

It will be seen that when H is moved it moves G and the spindle E. Liquid at once floats to one ram and the rudder is operated ; the tiller in moving shifts point K of the floating link G being actuated by the lever L, and in so doing returns the spindle E to mid position when the rudder ceases to move and is held until H is again moved. M is a spring-loaded bye-pass valve and arranged so that should the rudder be subjected to severe shock the stress will be relieved at a predetermined value and the rudder give way.

In so doing it shifts the spindle E and the pump immediately returns the rudder to its previous position.

Any leakage from any point is taken back to a small tank, and is returned to the system through a non-return valve on each cylinder. The whole system is thus self-contained and, being charged with oil, perfect lubrication at all the working parts is ensured and temperature effects eliminated.

The steering gear of the "Orama" was opened for inspection last June, after the vessel had completed five round voyages to Australia and run over 120,000 miles. No signs of wear could be discovered either on the bush or on the tiller. The hydraulic rams were tested for wear and found to be in perfect order.

The cylinder and the D tube were carefully measured by means of a micrometer gauge and it was found that the clearance was exactly the same as when the pump was originally made. The pistons of the pump were all separately gauged and the ball races

*Transactions Inst., N.A., Vol. LIII., page 217.

of the pump, all were in perfect order and no wear could be discovered, and the vessel sailed again on her sixth trip without any alteration or adjustment to the gear whatever.

This type of gear has been found admirable for motor ships and has been adopted on most of the higher powered vessels of this class. The first war vessel on which it was used was the "Hardy," a t.b. destroyer for the British navy, and the results of the working of the apparatus were so satisfactory that it is being fitted in the battleships of that navy. It is also being fitted in t.b. destroyers for the Japanese navy.

The transmitter has been found useful for an infinitude of purposes, including change speeds for road locomotion, lifts and hoists, cranes, sheer legs, electric searchlight towers, swing bridges, turn-tables, traversers, brake gear for cable laying, hydraulic presses, and machine tools, but the most valuable use to which it has been put on war vessels is for the manipulation of heavy guns.

The modern method of gun laying by which the gun is made to follow the target and the sight continuously laid, necessitates that the elevating and training gear must be actuated during the whole time that firing is taking place. Even with such a comparatively light gun as a 4-inch the effort to do this is considerable, but with larger sizes such as 6-inch guns, the effort is so great that it can be exerted for only a very short time and although various means have been introduced to meet this difficulty, it has not been possible to overcome it.

To meet these conditions the Coventry Ordnance Works have introduced the Hydraulic Transmission Gear, by means of which the effort to work the gun is reduced to a minimum, and the effort required to elevate or depress the gun or to train it remains constant in whatever position the gun lies, as the respective hand wheels only actuate the control spindles of the transmission gear, and are not affected by the position of the gun.

The gun can therefore be continuously kept laid on a target without fatigue to the gun-layers and this whatever motion the ship may have, thus materially improving the shooting by sustained action.

So far the application of the system has been only adopted for 6-inch guns but the advantages of the system are so obvious and the increase in rapidity and ease of working over the present manual system is so considerable that there is no doubt the application will be greatly extended. The plant for the 6-inch gun consists of a 1 H.P. electric motor driving two small Hele-Shaw pumps, each of the latter being only .75 cubic inch capacity. One of these two pumps operates directly a special rotary double cam motor which, by means of a worm and worm-wheel, operates the training gear of the gun. The other pump directly operates the double acting ram for elevating and depressing the gun. The ram is only 4 ins. in diameter and has a stroke of less than 12 ins.

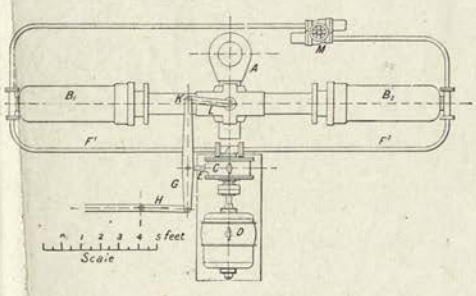


Fig. 39.

HELE-SHAW MARTINEAU STEERING GEAR.

MESSRS. JOHN HASTIE & CO., GREENOCK.

The arrangement of the gear is shewn in Fig. 40 where E is the electric motor, P1 the training pump, P2 the elevating pump, M the training motor, R the elevating ram cylinder and the distribution of the various pipes is clearly shewn.

It will be seen that the whole system for operating the gun is very compact. The control is of the simplest description, the elevation and depression of the gun being effected by the movement down or up of the hand-wheel W1, which acts on the stroke control of the pump P1. The movement of the ram R shifts the gun on its trunnion and also returns the pump control to central position. The training of the gun is similarly brought about by the hand-wheel W2 acting on control of P2. The movement of the motor M also centralises control.

If instead of employing electric transmission from a central station on the ship or fort to operate a gun, it is desired to make the whole system self-contained, it is easy to arrange for a small internal combustion engine to take the place of the electric motor shewn in the diagram; such system for instance can be employed in a turret or fort to operate the largest guns, with the advantage that the necessary power to operate the whole cannot be cut off from the outside.

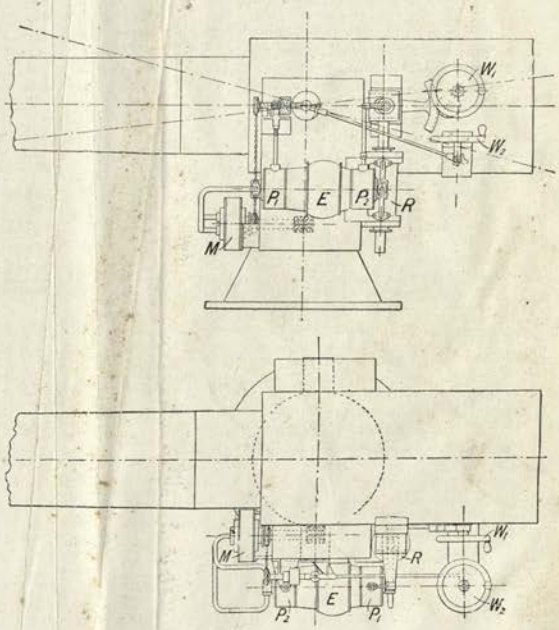


Fig. 40.

6-INCH GUN MOUNTING WITH HYDRAULIC TRANSMISSION GEAR.

COVENTRY ORDNANCE WORKS, LTD., COVENTRY.

BRITISH NAVY.

The advantages of the transmission for the heavy guns of cruisers have been found so considerable that it is being adopted for all the 6-inch guns on this type of vessel for the British navy.

SUBMARINE WARFARE.

Considerable space was given to this matter last year, and its importance pointed out. Since then its importance has even increased, and submarine arms are becoming more potent, both as regards the torpedo itself and the vessels to carry them.

In the case of the latter, the submarine cruiser is becoming an established fact, and considerable progress is being made towards the submarine outlined by General Cuniberti* in 1913. The great drawback at present is the great length of the torpedo compared with the beam of the vessel, and consequent difficulty in reloading the broadside tubes if they are placed at right angles to the line of keel.

The efficiency of the torpedo is becoming still more pronounced and the accuracy which can now be obtained with it is extraordinary when one considers the special difficulties met with both in aiming and discharging it correctly compared with the firing a projectile from a gun.

* "Rivista Marittima," March, 1913, page 199.

As regards range, speed, and exactitude, with the latest type of air heater and the introduction of the gyroscope, these have increased considerably during the last twelve months.

With the 18-inch torpedo the increase is as follows:—

Range obtainable.			Speed in knots.			
1000 metres	–	–	1913 – 43	1914	—	
2000 ,,	–	–	,, —	,,	43	
4000 ,,	–	–	,, 30	,,	35	
6000 ,,	–	–	,, 26	,,	30	

while with the 21-inch torpedo a mean speed of 30 knots can be obtained for a distance of 10,000 metres. This torpedo carries a charge of 150 kilos of explosive and it is considered that a hit with this weapon would do such damages to the hull of a battleship as would certainly send her to the bottom.

Seeing the great attention given to verifying the effects of shell against armour and the very considerable expenditure incurred in such trials, it is astonishing that so little is done to ascertain the effect of the attack of the modern submarine, and the best way to meet it; and this is the more surprising in face of the latest tendency to abandon the use of torpedo nets altogether.

The few that have been made go to prove that merely increasing the thickness of the plates on the ship's side is of little service, for these thick plates receive the full force of the explosion which not only destroys them but hurls them against the lighter bulkheads inside the ship, destroying them also, so that actually more harm is done than if the ship's plating had been of the usual thickness.

Another plan that is being adopted is to place a strong inner protective bulkhead as far as possible from the ship's side, and this has been made in some cases as much as 1½ ins. thick, but as time enters so largely into the question of the effective result, it is found that this permits the full effect of the explosion to reach too near the centre of the ship, so that although the vessel does not sink quickly, she is rendered almost helpless.

Yet another method of protection contemplates the use of a flexible screen about midway in the bunker space which should minimize somewhat the force of the explosion. But this also is found to be open to the same objection as the last mentioned type.

The plan which seems to have given the best results so far, is to place the armour as near as possible to the skin of the vessel but largely independent of it, and its component parts are also comparatively independent in a fore and aft direction; its attachments also are so arranged that although it may give its full protective power in arresting the rush of the torpedo, their destruction may not destroy the watertight jointing of the compartment, and finally particular attention is given to the arrangement of the jointing of the inner protective bulkhead and to its design so that its strength and attachments may be as uniform as possible. This last defence is of course placed as far as possible from the outer skin and is continuous longitudinally, the cross bulkheads terminating on one side and continuing on the other, instead of the usual plan of the cross bulkheads being continuous and the longitudinal ones meeting at them.

Progress in the submarine vessel is now proceeding in two directions, in one case the size and power of the submarine are being increased so that she may be completely independent and capable of attack under almost any circumstances, and in the other, efforts are being made to produce a highly efficient vessel of handy size, which can be carried to the desired place of combat and quickly launched on its deadly errand from a vessel suitably arranged for carrying as many as possible.

The result of this would appear to be that should any power well provided with such vessels be at war with another ill provided with them, this latter would have to keep her battleships in harbour and they would be thereby rendered inoffensive and comparatively useless. Whether this will eventually result in their disappearance altogether remains to be seen, but at the present moment the question of the day is certainly the progress being made in submarine attack and what can be done to meet it.

CHARLES DE GRAVE SELLS.

SILHOUETTE INDEX OF MERCHANT SHIPS OF THE WORLD.

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By W. A. BIEBER.

The silhouettes are not on scale and not intended for recognition of any particular ship, but merely to indicate general appearance.

Where Liners are important, recognition large scale silhouettes will be found at the end of the warship recognition silhouettes, at the beginning of each Navy in Part 1. These give all ships of 18 kts. or over.

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